A STUDY OF THE ORTHOPTEROUS GENUS MERMIRIA STÅL

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For a number of years we have found that any attempt to make determinations in this genus from the basis of the last revisionary treatise published upon it, that by Scudder in 1899, led us into difficulties, some clearly evident, others more subtle and then not possible of correction. In order to clear up the situation, Mr. Morgan Hebard and the author, in the course of extensive field work on the North American Orthoptera, have paid particular attention to this genus, as a result of which a most extensive series has been made accessible for study.

Within the last five years or so we have received an added incentive for making a comprehensive taxonomic, variational and distributional study of the genus *Mermiria*, in that we have had the pleasure and profit of association with Dr. C. E. McClung, who has made extensive studies on the chromosomes in this genus. From his work he was able to point out certain evident differentiations, which our studies show to be reflected in the external morphological features, and it was his earnest desire that a good taxonomic groundwork be laid for future work, cytological as well as morphological.

The author owes much to the encouragement and assistance of Dr. McClung in the preparation of this paper, the assistance being of a practical character, as the basic sorting of the whole series studied was made by him in intervals between his official duties, and the first draft of a key to the species was also drawn by him. The cordial coöperation and valued suggestions given by him have made easier some of the irksome portions of the examination and analysis of the really large series on which this paper is based. We are also indebted to our colleague, Mr. Hebard, for numerous suggestions and kindly criticisms, as well as unrestricted use of his collection.

MERMIRIA Stål

1839. *Opsomala* Serville, Hist. Nat. Ins., Orth., p. 586. (Part.)
1870. *Opomala* Thomas, Proc. Acad. Nat. Sci. Phila., 1870, p. 77. (Error for *Opsomala*.)

1873. *Mermiria* Stål, Recensio Orthopt., i, p. 102. [*M. belfragii* Stål.]
1877. *Mermiria* Scudder, Proc. Boston Soc. Nat. Hist., xix, p. 30.
1890. *Mermiria* Bruner, Proc. U. S. Nat. Mus., xii, p. 53.
1897. *Mermiria* McNeill, Proc. Davenp. Acad. Nat. Sci., vi, pp. 195, 203.
1899. *Mermiria* Scudder, Proc. Amer. Acad. Arts and Sci., xxxv, p. 41.
1904. *Mermiria* Bruner, Biol. Cent.-Amer., Orth., ii, pp. 26, 37.
1904. *Papagoa* Bruner, Ibid., ii, pp. 27, 42. [*P. arizonensis* Bruner.]

Genotype: *M. belfragii* Stål (=*Opomala neo-mexicana* Thomas). Type by monotypy.

Position of Genus.—The genus *Mermiria* is the sole member of the group Mermiriæ. The other genus placed in that group by Brunner, 1893, was *Syrbula*, and this has no close affinity with *Mermiria*, being instead a member of the group Amblytropidiæ.[1] No affinity exists with any of the typical Hyalopterygine genera, such as *Hyalopteryx, Achurum, Eutruxalis, Truxalis* and *Radinotatum*, but considerable resemblance and some real relationship is evident with *Pseudopomala*, which is an aberrant Hyalopterygid, probably connecting the latter group with the Mermiriæ. The genus *Acantherus* is not allied and its affinities are clearly with the Orphulellæ or the Amblytropidiæ, or perhaps both.

The exact position of the Mermiriæ in the sub-family Acridinae remains to be determined, and then only after a comprehensive study of the known genera, but it is evident that its development was probably from a Hyalopterygine stock, possibly through *Pseudopomala*, and the Mermiriæ should, at least, be kept in the general neighborhood of the Hyalopteryges.

Generic Description.—Form typically Truxaloid, elongate, alate. Head with facial line decidedly retreating: fastigio-facial angle evident: fastigium produced, angulate to rounded, weakly or not at all carinate, weakly or moderately impressed: lateral foveolæ obsoletely to appreciably indicated, sub-ventral in position, not visible from the dorsum: frontal costa sharply indicated, continuous, in part at least sulcate: lateral facial carinæ prominent, diverging ventrad: eyes ovoid to ovoid-elliptical, axis dorso-cephalad to ventro-caudad, moderately prominent from dorsum: antennæ ensiform, deplanate. Pronotum longitudinal, median carina indicated, with or without lateral carinæ: lateral lobes normal, with or without supplementary longitudinal carinæ at middle, ventral margin of lateral lobes distinctly or scarcely thickened: caudal margin of disk arcuate or angulate; prozona of dorsum

[1] This is very evident after making comparisons of *Syrbula* with a number of genera of the Amblytropidiæ. It is clearly not far removed from *Leurocerus* and *Amblytropidia*.

always longer than metazona. Tegmina and wings fully developed. Prosternum with low median protuberance or slight transverse ridge: mesosternal lobes separated by a distinct interspace or subattingent: metasternal lobes separated by a narrow interspace to attingent. Subgenital plate of ♂ very bluntly, moderately or strongly conoid produced, hardly compressed. Cephalic and median limbs short, slender. Caudal femora moderately robust to slender, genicular lobes and angles not produced; caudal tibiæ with spines of external margin more numerous than those of internal margin.[2]

Classification.—The features of greatest value in differentiating the species of the genus are almost entirely structural, although several color features are of relative, or even, in one case in one sex, of primary importance. The most important feature, and one which shows no intra-specific variation in this genus, is the presence or absence, and strength when present, of lateral pronotal carinæ. In all but *intertexta* there can be no question of the presence or absence of these structures, while in *intertexta* they are weakly indicated. In certain species there is found, bordering ventrad the paired dark lateral bars on the postocular region of the head and the lateral lobes of the pronotum, a strumose line or carina. This is distinctly indicated in *texana* and *alacris*, and incompletely and weakly so in *neo-mexicana* and *intertexta*. The lateral foveolæ of the vertex are of taxonomic importance in the depth of their indication, but there is some variation in this feature. The general form of the fastigium, of the fastigio-facial angle and the angle of the facial line are of value, but there is much variation in the exact degree of these features, particularly in that of the form of the fastigium. The proportion of length to depth of the lateral lobes of the pronotum is a feature which has considerable importance. The very slender or the average form of the caudal femora are also features of value, but there is much individual variation in that considered average, although the very slender type is more constant. The antennæ show certain specific types which, however, are very difficult to compare satisfactorily. The general form, whether average or very slender, is also an important feature in this genus. We find so little wing length variation that the relative form remains approximately uniform within each species.

[2] These are so variable in number (at least 15 to 24 on external, and 14 to 20 on internal margin) that they cannot be used as diagnostic features for the genus.

The diagnostic features given by Scudder in the key of his study of the genus are largely valueless, extensive series exhibiting clearly their variability. In a few cases their importance is relative, but not primary.

Morphological Variational Notes.—Probably the most striking feature of variation in the external morphology of the species of this genus is in the form of the fastigium, when viewed from the dorsum. Practically the only satisfactory method of comparison in the variation of this feature is to measure the angle, and the extremes have been figured and discussed under each species. The folly of using a feature of this sort in a strictly diagnostic sense is evident when it is known that certain species show variations of from 33° to 65° (*alacris*), 52° to 84° (*intertexta*), and 62° to 87° (*maculipennis maculipennis* and *mac. macclungi*) in the male sex, and 42° to 70°, 80° to 95°, and 65° to 95° respectively in the female sex. In addition to the exact angle there is much variation in the curvature or relative straightness of the margins themselves. The facial line shows occasional variation from the specific type, but these are generally geographic. The frontal costa varies much in its degree of sulcation and also in exact form, so much so that we prefer to dispense with it as a diagnostic feature. The form of the frontal costa, its exact width and relative depth are so variable that no great weight can be attached to these features. As we have already mentioned under "Classification," there is a very considerable amount of variation in the form of the caudal femora. Those species having the more slender type of caudal femora show less of such variation than the species having normally more robust and less attenuate femora.

There is a considerable amount of geographic variation in proportions and form, this being particularly apparent in southern Arizona material of *maculipennis* and *neo-mexicana*. In size, in addition, there is a very decided amount of geographic variation, the details of which are given under the individual species.

Color Pattern.—The basic color pattern of the genus is found in all the species, i. e. a pale base color, of a green, greenish-yellow, brownish or ochraceous tone, with a pair of dark postocular bars extending across the postocular portion of the head, the dorsal section of the lateral lobes of the pronotum, thence spreading out and to a greater or lesser degree continued as a narrow line on the pleura, and intensively coloring the marginal and discoidal fields of the tegmina. In addition there is frequently a medio-

longitudinal dorsal dark bar of variable strength and completeness, this always indicated in *texana* and carried over the anal field of the tegmina, leaving the anal angle pale. This mediolongitudinal line may be merely a lining of the median carina of the pronotum, or a pair of arcuate lines on the head. The tegmina in certain species (i. e., *bivittata* and both races of *maculipennis*) may show a maculate pattern of variable intensity. In all the species except *M. bivittata* the tegmina show a decided pale subcostal line on the proximal half in both sexes, while in *bivittata* the male sex is without such a line, although the female is marked as in the other species. In *M. neo-mexicana* and *alacris* the pale subcostal line broadens out into a wash which colors a very considerable portion of the tegmina, but its correlation with the subcostal line is evident. Occasionally the pale subcostal line is weak, but we have never seen it absent in any individuals but males of *bivittata*. The dark postocular lateral bars on the pronotum encroach upon the dorsal surface of the pronotum in numerous individuals of *maculipennis*, and in *texana*, *neo-mexicana* and *alacris* the dark postocular bars are bordered with yellowish. The lateral facial carinæ are similarly marked in the same species, and the face is variably infuscate in *texana*, *neo-mexicana*, *alacris* and *intertexta*.

Groups.—The genus comprises three groups, which at first glance appear more different than a detailed analysis indicates. One of these contains *texana* alone, another is made up of *neo-mexicana* and *alacris*, with *intertexta* an aberrant member approaching the third group, which is composed of *bivittata* and *maculipennis*. If the features separating these groups were more decided, or their differentiation more clearly indicated, it would be advisable to use subgeneric names for them, but this is not desirable, owing to the relatively slight divergence of the species, judging from external morphological features.

The groups and their chief features are:

Group A (*texana*)	Form relatively robust. Lateral foveolæ obsolete. Antennæ moderately heavy. Pronotum short. Lateral carinæ of pronotum distinct, diverging caudad. Supplementary carinæ on lateral lobes of pronotum distinct. Caudal limbs relatively robust. (Coloration distinctive.)

Group B	*neo-mexicana* *alacris* *intertexta*	Form slender, elongate. Lateral foveolæ weakly indicated. Antennæ very heavy. Pronotum elongate. Lateral carinæ of pronotum distinct or incompletely indicated (*intertexta*), faintly if at all divergent caudad. Supplementary carinæ on lateral lobes of pronotum distinctly (*alacris*) or weakly (*neo-mexicana* and *intertexta*) indicated. Caudal limbs elongate, slender.
Group C	*bivittata* *maculipennis*	Form less slender than in Group B, more attenuate than in Group A. Lateral foveolæ indicated to a greater (*maculipenuis*) or lesser (*bivittata*) degree of completeness. Antennæ heavy. Pronotum short. No lateral carinæ on pronotum. No supplementary carinæ on lateral lobes of pronotum. Caudal limbs relatively robust.

We feel quite confident that Groups A and B are the more primitive ones, but which of these two is closer to the ancestral type is difficult to say. In some ways *texana* appears the more generalized, in others *alacris* and *neo-mexicana*, with *intertexta* clearly a more advanced type. We feel, however, that, as *texana* represents a divergence from the type species (*neo-mexicana*) in antithetical characters from Group C, a clearer presentation of the interspecific relationship is shown by arranging the species as done herein.

Distribution of the Genus.—From southern New Jersey (*intertexta*), central Illinois (*neo-mexicana* and *maculipennis macclungi*), Iowa (*neo-mexicana*, *bivittata* and *maculipenuis macclungi*), Missouri River region of North Dakota (*neo-mexicana*), and eastern Montana (Forsyth—*maculipennis macclungi*); south to the Florida Keys (*intertexta*), the Gulf Coast (*bivittata*, *alacris* and *maculipennis maculipennis*), southern Texas (Mission and Lyford—*maculipennis maculipennis*), central Coahuila [Monclova] and northern Durango [Lerdo], Mexico (*texana*), and southern Arizona (Huachuca and Baboquivari Mountains—*texana*, *neo-mexicana* and *maculipenuis maculipennis*); from the eastern coast of the United States west to northern Utah (Salt Lake City—*maculipennis macclungi*), southern Nevada (Rioville—*maculipennis maculipenuis*), and central

southern Arizona (Baboquivari Mountains—*neo-mexicana* and *maculipennis maculipennis*). The genus is apparently absent, within this area, from the east central states, excepting certain portions of Illinois, and in the eastern states it has a very limited range, being absent from almost the entire Piedmont and more elevated regions, only a few records from above the fall-line in North Carolina, Georgia and Alabama being known. As one passes northward along the eastern coast the area of distribution narrows, until, in Virginia, it is merely the narrow coastal and estuarine marginal region. Beyond question a number of the species of the genus range over much of northern Mexico, but the lack of data from that region is so great that we can do no more than mention the probability of their occurrence.

All of the species are partial to grassland, tall salt marsh grass, grassy fresh marsh, prairie grassland, grass patches in park-like woodland, the clump type of bunch grass in arid steppe and sandhill regions and even grassy pockets on steep rocky slopes. While frequently taken on other vegetation, the presence of grass will be found to be the influencing factor, and the campestrian environment is the favorite situation.

Zonally the genus *Mermiria* is an inhabitant of the Lower Austral, Sabalian and Tropical Florida Zones in the eastern states, narrowly encroaching on the Upper Austral in the northeast, while in the western and central United States it occurs in the Upper and Lower Austral Zones, entering areas of the lower part of the Transition Zone in western Texas (Davis Mountains) and southern Arizona (Santa Catalina Mountains) and possibly in the northwestern United States (Montana and North Dakota).

When tested out for a probable center of distribution we find that far the greater proportion of the factors, to be considered in locating such a center, give central Texas as the center of the generic dissemination and differentiation. This is the region of greatest differentiation, dominance in individuals, location of synthetic forms (i. e., *bivittata* and *maculipennis, neo-mexicana* and *alacris*), maximum size of individuals, convergence of lines of dispersal and of least dependence on a restricted habitat.[3]

[3] Our quotation of these criteria should not be taken as an indication that we are convinced of the propriety of using all of them for such work. We are following the general practice in so using them, but at least one, i. e. area of maximum size of individuals, can hardly be given equal importance with the others. The advent of species of insects into a favorable habitat, removed from their normal natural enemy control, often produces colonies of maximum sized individuals.

History.—The first species known belonging to the present genus was described by Serville, in 1839, as *Opsomala bivittata*.[4] The locality given was "North America," and the specimen described was from the Latreille Collection. The identity of this insect has been the disturbing factor in all subsequent work in the genus, but we have sufficient knowledge now to show that Latreille received material from Palisot de Beauvois and Bosc, and that the exact locality was probably in the Carolinas. In consequence we feel fully satisfied with our placing of Serville's name. In 1870, Thomas described another species as *Opomala* [sic] *neo-mexicana*, from northeastern New Mexico,[5] while in 1873 Stål erected the genus *Mermiria* for his new species *M. belfragii*, described from Texas,[6] which is identical with *neo-mexicana*. In 1877, Scudder described a third species from Georgia, under the name *Mermiria alacris*;[7] while, in 1890, Bruner described the striking *M. texana* from El Paso, Texas, and Lerdo, Durango, Mexico,[8] and also *M. maculipennis* from San Antonio and Carrizo Springs, Texas.[9] McNeill, in 1897, in his Revision of the Truxalinae, published the first study of the genus, and there described *M. rostrata*, from Mackay, Indian Territory.[10] The latter, we are now able to say, is but an extreme condition of *alacris*. McNeill made the error of referring material representing three different species to *bivittata*, and his study left us with no better conception of the group than we had before its publication. In 1899, Scudder published a short review of the species of the genus,[11] separating the eastern hygrophilous species as *M. intertexta*, and also describing *M. vigilans*, which latter has given authors considerable trouble since then, but which we now know to be an individual condition of *M. alacris*. Scudder united *maculipennis* with *bivittata*, "as at most only a variety." In 1904, in the Biologia Centrali-Americana, Bruner retained for the species of the genus the nomenclature used by Scudder in 1899.[12] In the same work he also erected[13] a new genus and species, *Papagoa arizonensis*,

[4] Hist. Nat. Ins., Orth., p. 589, (1839).
[5] Proc. Acad. Nat. Sci. Phila., 1870, p. 77, (1870).
[6] Recens. Orthopt., i, p. 102, (1873).
[7] Proc. Boston Soc. Nat. Hist., xix, p. 30, (1877).
[8] Proc. U. S. Nat. Mus., xii, p. 53, pl. I, fig. 11, (1890).
[9] Ibid., p. 54, (1890).
[10] Proc. Davenp. Acad. Nat. Sci., vi, pp. 205, 207, pl. I, fig. 3c, (1897).
[11] Proc. Amer. Acad. Arts and Sci., xxxv, pp. 41 to 44, (1899).
[12] Biol. Cent.-Amer., Orth., ii, pp. 38 to 39, (1904).
[13] Ibid., pp. 27, 42, (1904).

for a specimen from "Arizona or Northern Mexico," which we now know to be a shrivelled alcoholic individual of *Mermiria texana*.

Material.—In the preparation of the present paper the types of the following species have been examined by us:

Mermiria texana Bruner.
Papagoa arizonensis Bruner (synonym of *M. texana*).
Opomala neo-mexicana Thomas.
Mermiria alacris Scudder.
Mermiria vigilans Scudder (synonym of *M. alacris*).
Mermiria intertexta Scudder.
Mermiria maculipennis Bruner.
Mermiria maculipennis macclungi new subspecies.

The entire series of the genus examined by us and here recorded numbers 1514 specimens. The majority (938) of these were taken by Rehn and Hebard on recent trips and are located in the Hebard Collection and that of the Academy of Natural Sciences of Philadelphia. Of the remainder of the representation we have had before us, 50 specimens were from the Hebard Collection ex Bruner, 33 specimens from the Scudder Collection at the Museum of Comparative Zoology at Cambridge, Massachusetts, 73 specimens from the United States National Museum, 39 specimens from the collection of Prof. A. P. Morse, 12 from that of Prof. M. P. Somes, 3 from the Illinois State Laboratory of Natural History, 103 from the Academy of Natural Sciences of Philadelphia (other than Rehn and Hebard collecting), and 263 specimens from other collections and institutions, including the Hebard Collection other than Rehn and Hebard collecting and ex Bruner. In addition to this material we have re-examined considerable material already recorded by Rehn and Hebard, and not included in these totals. All the institutions and collections represented in the studied series are indicated by their initials in the summaries of material under the species, with the exception of the series collected by Rehn and Hebard, which it should be understood, are in the Hebard Collection and that of the Academy of Natural Sciences of Philadelphia.

We wish to express our hearty thanks to the above mentioned gentlemen, and the authorities of these museums for their assistance in the present study. We have been able, with their assistance, to gather together a sufficiently extensive and representative series of the genus to give authority and permanency to the conclusions here reached.

Key to Species.

We would suggest that, in using this key, frequent reference be made to the figures accompanying the paper. Occasionally insistence is made upon a single differential character, and in such cases it should be borne in mind that these characters are the crucial ones, not subject to fluctuation by variation. Other features may aid in distinguishing the forms, and these are detailed under the specific treatments, but variation will occasionally rob these features of their critical value.

A. Lateral carinæ of pronotum strongly or weakly (*intertexta*), but always appreciably indicated. Form slender or relatively robust; when of the latter type the tegmina bear a longitudinal pale line in distal half of discoidal field, in addition to the strongly marked proximal subcostal line and pale anal angles of tegmina.

B. Supplementary carinæ on lateral lobes of pronotum evident (rather weakly in *neo-mexicana*). Species decidedly or typically xerophilous.

C. Form relatively robust. Lateral carinæ of pronotum decidedly diverging caudad, rarely by variation subparallel. Lateral lobes of pronotum with ventral margin shorter than depth of lobes. Tegmina relatively broad. Color pattern bold, distinctive; subcostal pale line of tegmina strongly marked, narrow; medio-longitudinal dorsal line invariably present. Antennæ moderately ensiform. Caudal femora relatively robust, almost invariably falling distinctly short of the tegminal apices. Subgenital plate of male short, weakly produced, blunted. *texana* Bruner

CC. Form slender. Lateral carinæ of pronotum not at all, or, by variation, faintly diverging caudad. Lateral lobes of pronotum with ventral margin longer than depth of lobes. Tegmina relatively narrow. Color pattern with broad medio-longitudinal dorsal line rarely present. Antennæ strongly ensiform. Caudal femora slender (surpassing, equalling, or falling faintly short of tegminal apices). Subgenital plate of male produced, elongate pyramidical.

D. Fastigium more semi-elliptical, the sides converging in a well-rounded curve, the tip very broadly or at least bluntly rounded. Subgenital plate of male moderately produced. Species campestrian, central and western in habitat ..... *neo-mexicana* (Thomas)

DD. Fastigium triangular, the sides converging in straight or only slightly curved lines, the tip narrowly rounded. Subgenital plate of male greatly produced. Species

inhabiting grassy woodland, central and southeastern in habitat ..... *alacris* Scudder

BB. No supplementary carinæ on lateral lobes of pronotum. Species invariably hygrophilous. (Form very elongate. Ventral margin of lateral lobes of pronotum longer than depth of lobes. Subgenital plate of male greatly produced. Eastern and southeastern coast.) *intertexta* Scudder

AA. No lateral carinæ indicated on pronotum. Form relatively robust; tegmina but faintly or not at all surpassing the apices of the caudal femora.

B. Male with no subcostal pale bar on the proximal half of the tegmina. Fastigio-facial angle, when seen from the side, more broadly rounded in both sexes.[14] Coloration more frequently greenish. Species central and southeastern in habitat ..... *bivittata* (Serville)

BB. Male with subcostal pale bar on the proximal half of tegmina. Fastigio-facial angle, when seen from the side, more narrowly rounded and more angulate in both sexes.[14] Coloration more frequently buffy. Species central and western in habitat.

C. Form more attenuate and elongate. Pronotum distinctly more elongate and appreciably constricted mesad; caudal angle of disk of pronotum very broadly and weakly angulate. Eyes of female moderately prominent, when viewed from the dorsum. Size in general larger. South-central and southwestern in habitat.

maculipennis maculipennis Bruner

CC. Form less attenuate and elongate. Pronotum shorter and relatively broader, not appreciably constricted mesad; caudal angle of disk of pronotum more distinctly produced and angulate. Eyes of female less prominent, when viewed from the dorsum. Size in general smaller. North-central in habitat.

maculipennis macclungi new subspecies

Treatment of Species

Mermiria texana Bruner. Plate V, figs. 1-14.

1890. *Mermiria texana* Bruner, Proc. U. S. Nat. Mus., xii, p. 53, pl. I, fig. 11. [♂ ♀: El Paso, Texas; Lerdo, Durango, Mexico.]

1897. *Mermiria texana* McNeill, Proc. Davenp. Acad. Nat. Sci., vi, pp. 204, 206. [Lerodo (error for Lerdo), Durango, Mexico; El Paso, Texas; Colorado Springs, Colorado; Fort Grant, Arizona.]

1899. *Mermiria texana* Scudder, Proc. Amer. Acad. Arts and Sci., xxxv, pp. 41. 42. [Colorado; Coahuila, Mexico; also summary of previously reported localities.]

1902. *Mermiria texana* mut. *viridis* Cockerell, in Scudder and Cockerell, Proc. Davenp. Acad. Sci., ix, p. 24. [Las Vegas Hot Springs, New Mexico.]

1904. *Mermiria texana* Bruner, Biol. Cent.-Amer., Orth., ii, p. 38, pl. I, figs. 19. 19a. [Summary of previous records.]

1904. *Papagoa arizonensis* Bruner, Ibid., p. 42. [♂: Arizona or northern Mexico.]

[14] These features are relative and average, and by variation overlapping.

The present species stands in a relatively isolated position in the genus, and it has been suggested to the author that it should be subgenerically differentiated from the genotype. We do not feel warranted in taking such action at this time, as we lack sufficient evidence to justify it. However, *texana* can be readily distinguished from all the other forms of the genus by combining with lateral pronotal carinæ and supplementary carinæ on the lateral lobes of the pronotum, a relatively robust form, short male subgenital plate, relatively short and robust caudal femora and a strikingly contrasted and longitudinally barred color pattern. The latter is mainly featured by a pronounced, broad, medio-longitudinal dark bar, pale anal angles on the tegmina, a second pale line in the distal half of the discoidal field of the tegmina and incomplete barring on the dorsal surface of the caudal femora.

Type.—♂; El Paso, Texas; [November, 1887]; (L. Bruner); [Hebard Collection ex Bruner, Type no. 21]. Designated by Rehn and Hebard, 1912.[15]

Allotype.—♀; same data as type.

Of the original series the type and the allotypic female are now before us, a paratypic El Paso male, in the collection of the United States National Museum, has been examined, and a paratypic female from Lerdo, Durango, Mexico, in the Hebard Collection ex Bruner, is also in hand.

The species is sharply defined and so easily recognized by the features given in the key, and by the figures, that no description is necessary. The following comments cover the more noteworthy features of variation.

Morphological Notes.—The variation in fastigial form found in most of the species of this genus is well examplified in *texana*. In each of the series from Sanderson, Persimmon Gap, Pine Mountain and Prescott we find males (figured) which show a range from a moderately acute-angulate to a strongly acuminate outline. In the females this variation is rarely decided, yet occasionally we find it distinctly marked, the three females from Canyon behind Pulliam Bluff, Chisos Mountains, showing different types with well-marked extremes, the two females from Lost Mine Peak, Chisos Mountains, are very different in this respect, while the extremes of the twenty-eight Marathon females are decidedly

[15] Proc. Acad. Nat. Sci. Phila., 1912, p. 62, (1912).

different. There is very considerable variation in the relative width of the pronotum, particularly in the female, the greatest width varying very decidedly in proportion to the length. This variation, in its most decided phase, has no geographic correlation, the Marathon series alone showing both the markedly different forms figured. In both sexes there is a weak but apparent tumidity of the pronotum caudad in the majority of the specimens, but more pronounced in the male. This is occasionally almost absent and there is no geographic correlation in this variation in width, nor is there any apparent correlation with the proportion of width to length.

Synonymy.—We have before us the unique male type of *Papagoa arizonensis* Bruner. As mentioned by Bruner, the specimen has been dried from alcohol and is greatly shrivelled. The form of the fastigium has been greatly altered, being unnaturally acute and the dorsal surface of the same part is greatly distorted. The specimen is unquestionably a male individual of *Mermiria texana*, of the general size of material of that sex from southern Arizona. The genus *Papagoa* and the species *arizonensis* must be sunk in synonymy under *texana*. Cockerell's mutation *viridis* we have not seen, but we must decry the use of technical names for such phases, as the logical outcome would be the enforced establishment of thousands of similar names in the Orthoptera, for well known and easily recognized manifestations of elementary, probably physiological and clearly non-genetic, influences.

Measurements (in millimeters).

♂	Length of body.	Length of pronotum.	Length of tegmen.	Length of caudal femur.
Sanderson, Texas	25.5	3.9	20.4	14.8
Sanderson, Texas	26.5	4.2	22.5	16.6
Marathon, Texas	29.2	4.5	22.7	16.5
Marathon, Texas	31.5	5.1	25.6	17.5
Persimmon Gap, Texas	24.9	4.1	19.4	13.5
Persimmon Gap, Texas	29.5	4.6	24.2	17
Lost Mine Peak, Texas	29	4.7	24.6	17
Lost Mine Peak, Texas	30	5	25	18
Pine Mountain, Texas	25	4	20.3	14.6
Pine Mountain, Texas	28.3	4.8	24.4	17.9
El Paso, Texas, *type*	30.2	5	27	18.2
Franklin Mountains, Texas	29.2	5	25.2	17
Franklin Mountains, Texas	32.3	5.3	27.6	18.2
Rock House Canyon, Arizona	26.8	4.4	24.4	16.5
Mud Springs, Arizona	25.2	4.2	21	14.5
Mud Springs, Arizona	25.2	4	21.7	14.7
Prescott, Arizona	23	3.6	18.5	12.8
Prescott, Arizona	25.2	4	22	15.5
Mount Tritle, Arizona	23.8	4.1	19.4[16]	13.8

[16] Apex incomplete.

♀	Length of body.	Length of pronotum.	Length of tegmen.	Length of caudal femur.
Sanderson, Texas	35	5.7	27.8	20.2
Marathon, Texas	40.5	6	29.8	21
Marathon, Texas	51	7.3	35.8	25.4
Persimmon Gap, Texas	37	5.7	29	20.4
Persimmon Gap, Texas	41.2	5.9	31.6	21.9
Lost Mine Peak, Texas	40	6.3	31.5	21.8
Lost Mine Peak, Texas	43.5	6.6	32.5	24
Pine Mountain, Texas	40.5	6.1	29.5	21.5
Pine Mountain, Texas	45	6.7	31.5	23
El Paso, Texas, *allotype*	45	6.5	34.4	—
Franklin Mountains, Texas	48.5	7.2	35	23.7
Jemez Hot Springs, New Mexico	36.8	6.4	30.6	22
Jemez Hot Springs, New Mexico	43.6	6.5	32.2	23
Rock House Canyon, Arizona	42	6.5	32.5	23.5
Rock House Canyon, Arizona	44.5	6.5	32.5	22.8
Carr Canyon, Arizona	40	6.5	32	23.5
Carr Canyon, Arizona	46.5	7.5	34	24.5
Mud Springs, Arizona	40.5	6.2	29.5	21.5
Mud Springs, Arizona	41	6.2	32	22.8
Prescott, Arizona	32.2	5.5	26.2	19
Prescott, Arizona	36	6	30	21.2
Lerdo, Durango, Mexico, *paratype*	45.3	7.4	35.4	24.7

From these figures, which have been taken from extremes in the representations where more than two of each sex are present, it is evident that individuals are of minimum size at the higher elevations and at the periphery of the range. The Sanderson material, which, while taken at a low elevation, is from the eastern known limit of the range, and that from Mud Springs, Prescott and Mount Tritle at the western limit and quite elevated, present the minima, while specimens from Persimmon Gap, another quite eastern locality, are quite close in size; Pine Mountain, another quite elevated station, also presents uniformly small individuals. The optimum of size is developed in the Eastern Desert region (Franklin Mountains, Aden and Lerdo).

Color Notes.—The greenish phase of this species, which we have never seen adult, was named by Cockerell.[17] The description of immature individuals of both color phases has been given elsewhere by the same author.[18] From the present material the principal individual color variations appear to be: a fluctuation in depth of the dorso-median dark bar of the head, pronotum and proximo-sutural section of the tegmina; an occasional dark livid suffusion of the ventral half of the lateral lobes of the pronotum; a weak maculation of the tegminal intercalary area and some instability in the strength of the femoral markings. The dorsal bar ranges from nearly solid, through a type with paler center to

[17] Proc. Davenp. Acad. Sci., ix, p. 24, (1902).
[18] Psyche, ix, p. 430, (1902).

an extreme with the bar itself virtually eliminated, leaving only a pair of arcuate lines on the head (lateral margins of the bar) and a median dark line on the median carina of the pronotum. The geographic color variation is largely tonal. The Sanderson and Persimmon Gap series have the pale areas quite whitish, the brown Vandyke brown; the Marathon series and those from the El Pasan region run to yellow in the pale areas, while the Arizonan series largely (but not entirely) to light pinkish buff in the same sections. The pale markings in the vicinity of the humeral trunk of the tegmina, however, are always more whitish than the other pale areas. The Pine Mountain series has a strongly intensive type of coloration, the brown being very dark (blackish brown) and the pale areas dull soiled buffy.

Distribution.—The range of this species extends from an undetermined point in Colorado, at least as far north as Salida and Colorado Springs,[19] south to northern Durango (Lerdo) and east-central Coahuila (Monclova),[20] Mexico; east almost to the Pecos River (Sanderson), Texas, west to central (Oak Creek Canyon), and southern (Santa Catalina, Santa Rita and Huachuca Mountains) Arizona. It doubtless extends south for a considerable distance in the central mountainous regions of northern Mexico. Its zonal range is Upper and Lower Sonoran, occurring in Upper Sonoran islands in Transition surroundings.

Its vertical distribution is, on the basis of present records and information, from 2750 feet (Sanderson, Texas) to 7000 (Pine Mountain and Lost Mine Peak, Texas) and even 7300 feet (Mount Tritle, Arizona). In Texas alone the records range from the minimum to near (7000 feet) the maximum elevations known for the species, while in Arizona the records cover localities from 3800 feet (Sabino Basin) to 7300 feet (Mount Tritle).

Biological Notes.—This insect is a very active one and flies quickly upon being approached. The dried specimen would hardly be called protectively colored, with its boldly striped

[19] The specimen given by Scudder as "Colorado, 7000 (Morrison)" is also clearly this species. We feel quite certain it came from the more southern part of the state.

Caudell (Proc. U. S. Nat. Mus., xxvi, p. 780, (1903)) reported a pair of this species from Fort Collins, Colorado, and, with some doubt, immature material from Salida, Colorado. These specimens are now before us. The Fort Collins pair are typical of *M. maculipennis macclungi*, while a pair of immature specimens from Salida clearly represent *texana*.

[20] Reported as Montelovez; see comments by Hebard, Proc. Acad. Nat. Sci. Phila., 1917, p. 252, (1917).

pattern, yet in short yellow grass, or tufted bunch grass, the species is not easy to locate, often never being seen unless marked down after a flight. It is distinctly a hillside species, rarely found on dirt hills, but with a strong preference for stony or rocky slopes, with scattered cover of short grass or bunch grass, and dotted with lecheguilla (*Agave lechuguilla*), agaves (*Agave schotti* and *palmeri*), bear grass (*Nolina microcarpa*), ocotillo (*Fouquieria splendens*), sotol (*Dasylirion leiophyllum* and *wheeleri*) and cacti. Near the upper limits of its vertical distribution it occurs in the open spots of scrub oak areas. In southern Arizona it is a species of the Desert and Encinal regions, as they have been delimited by Shreve.[21] In but a single case have we noted the species in flat land, then at Marathon, Texas, where two were seen on the plain some distance from the hills where individuals of the species were numerous.

The species has been taken adult as early as June 10 to 12 (Chisos Mountains, Texas) and as late as November (El Paso, Texas, and Lerdo, Durango, Mexico). The latest exact date we have is October 14 (Rock House Canyon, Arizona), immature individuals in the stage preceding maturity being taken as well as adults. It is possible the species matures earlier and persists later in the season southward at lower elevations than toward the northern limit of its range, or at higher elevations southward, but the evidence is not fully conclusive. The earliest records we have for northern New Mexico are August 10 (Las Vegas Hot Springs) and August 12 to 20 (Jemez Hot Springs), while we have adults from the border region taken from July 9 (Franklin Mountains, Texas) and 18 (Mud Springs, Arizona[22]) on. However, we have a single adult male from Prescott, Arizona, taken July 7, and a good series of both sexes from the same locality, taken from July 9 on. The latest date for immature specimens in the Prescott series is August 5, while we have adults taken as late as August 25. At Pine Mountain, Davis Mountains, Texas, elevation 5800 to 7000 feet, we found both adults and immature specimens common on August 31, which shows a late maturing season at an elevated locality in a relatively southern region, while, as stated above,

[21] Publ. 217, Carneg. Inst. Wash., pp. 15–29, (1915).

[22] The occurrence of adults so early, at a locality relatively so high (6800 feet), can be explained, we are certain, by slope exposure. The locality is on a warm south-facing slope, at the upper edge of the Encinal region. Shreve (Publ. 217, Carneg. Inst. Wash., p. 97 et seq., (1915)) has carefully analyzed the role of slope exposure in the Santa Catalina Mountains.

immature specimens were also present at Rock House Canyon, Arizona, on October 14. Identifiable immature specimens are before us, taken July 7 (Prescott, Arizona) and July 8 to 11 (Sabino Basin, Arizona).

Specimens examined: 349; 187 males, 127 females, 13 immature males, 22 immature females.

Texas: Sanderson, Terrell County, 2750 to 3180 feet; VIII, 25, 1912; (R. & H.; scarce in sotol (*Dasylirion*) and grasses in bed of canyon water course and in similar situations on adjacent steep slopes); 7 ♂, 1 ♀. Marathon, Brewster County, 3940 to 4160 feet; VIII, 26 to 27, IX, 12 to 13, 1912; (R. & H.; very common on rocky hillsides, especially toward top, two seen on plain far from hills); 22 ♂, 17 ♀; VIII, 20, 1916, (R.; relatively common on hill slopes); 4 ♂, 6 ♀; [Hebard Cln.]. Persimmon Gap, Santiago Mts., Brewster County, IX, 3 and 10, 1912; (R. & H.; near grass tufts on rocky hillside with much lecheguilla, *Agave lechuguilla*); 11 ♂, 2 ♀. Between Neville Spring and Government Spring, Chisos Mts. slope, Brewster County, 3600 to 3800 feet; IX, 5, 1912; (R. & H.; on slope with little grass and much lecheguilla, yucca and creosote bush, *Covillea*); 1 ♀. Chisos Mts., Brewster County, VI, 10 to 12, 1908, (Mitchell and Cushman; at light), 1 ♂; [U. S. N. M.]: VII, 1911, (H. A. Wenzel); 3 ♂, 7 ♀; [A. N. S. P.]. Moss Well, Chisos Mts., Brewster County, 4500 to 5000 feet; IX, 5 to 8, 1912; (R. & H.; scarce in grasses on hillside, immatures common); 2 ♂, 1 ♀, 1 juv. ♂, 2 juv. ♀. Canyon behind Pulliam Bluff, Chisos Mts., Brewster County, 4600 to 5000 feet; IX, 7, 1912; (R. & H.; in high grass and sotol); 2 ♂, 3 ♀. Lost Mine Peak, Chisos Mts., Brewster County, 5500 to 7000 feet; IX, 7, 1912; (R. & H.; in open places of oak scrub on steep slope, few above 6000 feet); 7 ♂, 2 ♀. Alpine, Brewster County, IX, 8, 1911; (F. C. Bishopp); 1 ♀; [U. S. N. M.]. Puertacitas Mts., Presidio County, 5100 to 5200 feet; VIII, 31, 1912; (R. & H.); 1 ♂. Pine Mountain (slope), Davis Mts., Jeff Davis County, 5800 to 7000 feet; VIII, 29, 1912; (R. & H.; common in high bunch grass); 22 ♂, 4 ♀, 7 juv. ♀. Sierra Blanca, El Paso County, 4750 feet; IX, 14, 1912; (R. & H.; on slopes of low desert hill); 1 ♂. Quitman Mts., El Paso County, 4800 to 5400 feet; IX, 14, 1912; (R. & H.; occasional on hillside in grasses); 2 ♂, 1 ♀. Franklin Mts., El Paso County, 4500 to 5500 feet; IX, 15 to 16, 1912; (R. & H.; on barer slopes with lecheguilla, creosote bush, a few grasses and other desert plants); 10 ♂, 4 ♀.

New Mexico: Jemez Hot Springs, Sandoval County; VIII, 12 to 20, 1913, IX, 17, 1914; (John Woodgate); 4 ♀; [Hebard Cln.].

Arizona: Prescott, Yavapai County, 5400 to 5600 feet; VIII, 14 to 24, 1917; (J. A. Kusche); 3 ♂, 2 ♀: VII, 7 to VIII, 25, 1917; (O. C. Poling); 68 ♂, 54 ♀, 5 immature ♂, 7 immature ♀; [Hebard

Cln.]. Near Battle Mountain, near Prescott, Yavapai County; VIII, 18, 1917; (J. A. Kusche); 4 ♂, 4 ♂; [Hebard Cln.]. Near Granite Peak, Sierra Prieta, Yavapai County; VIII, 17, 1917; (J. A. Kusche); 3 ♂, 1 ♀; [Hebard Cln.]. Mount Tritle, Yavapai County, 7300 feet; VIII, 27 to 28, 1917; (J. A. Kusche); 1 ♂; [Hebard Cln.]. Rock House Canyon, Chiricahua Mts., Cochise County, 4600 feet; X, 14, 1910; (R. & H.; in high grasses among great rocks); 1 ♂, 3 ♀, 2 immature ♂, 1 immature ♀. Santa Rita Mts., 5000 to 8000 feet; (Snow); 7 ♂, 3 ♀; [Univ. of Kansas]. Mud Springs, Santa Catalina Mts., Pima County, 6800 feet; VII, 18 and 19, 1916; (Lutz and Rehn; immature and adults moderately common on slopes under oaks and on crumbling rocks); 5 ♂, 6 ♀, 1 immature ♂, 3 immature ♀; [A. M. N. H. and A. N. S. P.]. Sabino Basin, Santa Catalina Mts., Pima County, 3800 feet; VII, 8 to 11, 1916; (Lutz and Rehn; on slopes with bunch grass, lechequilla, agave and bear grass (*Nolina*); 1 immature ♂, 1 immature ♀, [A. M. N. H. and A. N. S. P.].

Colorado: Salida, Chaffee County; VIII, 2, 1901; (Dyar and Caudell); 2 immature ♂, 1 immature ♀; [U. S. N. M.]. Colorado Springs, El Paso County; VII, 1877; 1 immature ♂; [U. S. N. M.].

In addition, previously recorded material from El Paso and Franklin Mountains, Texas; Aden, New Mexico; Carr Canyon, Huachuca Mountains, Arizona, and Lerdo, Durango, Mexico, has been before us.

Mermiria neo-mexicana (Thomas). Plate V, figs. 15-27; Plate VII, fig. 7.

1870. *O*[*pomala*] *neo-mexicana* Thomas, Proc. Acad. Nat. Sci. Phila., 1870, p. 77. [♀: Northeastern New Mexico.]
1873. *M*[*ermiria*] *belfragii* Stål, Recensio Orthopt., i, p. 102. [♀: Texas.]
1874. *Opomala neomexicana* Glover, Ill. N. Amer. Ent., Orth., pl. 16, fig. 10.[23]
1876. *Mermiria neomexicana* Scudder, Bull. U. S. Geol. Surv. Terr., ii, p. 262. [Juv.; Clear Creek Canyon and Manitou, Colorado.]
1897. *Mermiria neomexicana* McNeill, Proc. Davenp. Acad. Nat. Sci., vi, pp. 205, 206. ["Eastern slopes of the Rocky Mountains from Wyoming to New Mexico and eastward to Georgia."]
1899. *Mermiria neomexicana* Scudder, Proc. Amer. Acad. Arts and Sci., xxxv, pp. 42, 43. [Pueblo, Colorado; Dallas and Bosque County, Texas.]
1904. *Mermiria neo-mexicana* Bruner, Biol. Cent.-Amer., Orth., ii, p. 39. [New Mexico; Texas; Villa Lerdo, Durango, Mexico.]

As we have indicated in the generic discussion of classification and in the key to the species, this species is closely related solely to *alacris*, with which it comprises Group B of the genus, and which has, however, a different, though contiguous and slightly

[23] This figure is extremely poor and may possibly have been taken from a discolored specimen of *texana*, instead of *neo-mexicana*. However, we have no means of checking the source of the drawing and can only let it stand in the references of *neo-mexicana*.

overlapping, area of distribution. From *alacris*, *neo-mexicana* can be chiefly distinguished by the more semi-elliptical fastigium, the sides of which converge in well-rounded curves, with the apex very broadly, or at least obtusely, rounded, and in the subgenital plate of the male being but moderately produced. The coloration of the two species is usually distinctive, but not invariably so. Very rarely, in the male sex, the fastigium will be unusually angulate in *neo-mexicana*, so much so that the separation of such specimens from *alacris* is difficult. The male subgenital plate will be found, however, to furnish a good index of the specific position of the specimen, almost invariably supported by coloration features. In their habitats the two species frequent radically different environments, *neo-mexicana* being invariably campestrian and *alacris* a species of woodland cover or recently cleared timber land, which still retains its low growth or has grown up in woodland scrub.

Type.—♀ ; Northeastern New Mexico. [United States National Museum, Type No. 1030.]

This specimen has been dried from alcohol, but the species has been correctly determined by all subsequent authors excepting Stål, who probably was unacquainted with the description of *neo-mexicana*. Measurements of the type are given below.

Morphological Notes.—The principal points of morphological variation are: general form; horizontal angle of fastigium and angle of face. The general form is slender, but the series from the Baboquivari Mountains, Arizona, shows an average more robust form in both sexes. This is not an absolute condition, however, but an average, as several specimens, representing both sexes, from that locality are but little different from numerous individuals taken from the entire series of the species. This greater bulk applies to depth as well as breadth, and is correlated with a generally less strongly declivent face and a broader fastigial angle. The form of the fastigium varies in both sexes to at least as decided a degree as in the other species of the genus, yet being, as a whole, shorter, broader and blunter in the Baboquivari Mountains specimens than in the others. There is, however, appreciable variation in these features in even the limited series from that locality, and in series such as those from Cisco, Marathon and Dallas, Texas, and Syracuse, Kansas, the range of variation is very pronounced in each, the extremely narrow, most acute type

looking quite different from the short, rounded sub-rectangulate extreme found in the Baboquivari Mountains individuals, and relatively closely approximated in a number of the specimens from other localities.

The angle of declivence of the facial line shows considerable variation, being, as a rule, more strongly retreating in the more slender individuals. Thus the least retreating faces are found in the more robust Baboquivari specimens, but there is very considerable variation in that series in this respect, so much so that extremes from that locality have their heads, when viewed from the side, quite different in general inclination of the face. The frontal costa varies, of course, in its width and also in its relative depth, with the greater or lesser narrowing of the general form, the quite slender specimens having the costa narrow and with the sulcus more regularly defined, deeper and, as would be expected, narrower and more sharply defined dorsad than in the more robust specimens.

The tegmina show a slight amount of variation in their relative width, but this is not at all decided. See Remarks for discussion of the value of the morphological differences.

Synonymy.—Stål's *belfragii* is clearly the same as Thomas' older species. The description is matched by numerous individuals in the series before us. The name was first properly synonymized by McNeill in 1897.

Measurements (in millimeters).

♂	Length of body.	Length of pronotum.	Length of tegmen.	Length of caudal femur.
Hot Springs, South Dakota	29	4.4	16.9	15.6
Little Big Horn River, Montana	28.5	4.6	19.7	15.8
Havana, Illinois	32.2	4.6	20.6	18.3
Sidney, Nebraska	26.4	4.1	19	15.1
Sidney, Nebraska	27	4.4	18.6	14.4
Dodge City, Kansas	28.5	4.6	20.4	17.5
Dodge City, Kansas	31.2	4.8	20	17.1
Syracuse, Kansas	33.8	5.2	22	19
Syracuse, Kansas	34	5.1	23.3	20
Julesburg, Colorado	29.5	4.8	21.3	17.1
Holly, Colorado	37.1	5.5	24.9	19.2
La Junta, Colorado	29.7	5	21.8	17.6
La Junta, Colorado	31	5	21.3	18.6
Cache, Oklahoma	35.3	5	25	19.5
Mountain Park, Oklahoma	36.6	5.1	25.2	21.8
Summit of Mt. Sheridan, Oklahoma	35	5.3	24.4	21
Dallas, Texas	32	4.7	22.8	18.9
Dallas, Texas	36.5	5.6	26.4	22.3

	Length of body.	Length of pronotum.	Length of tegmen.	Length of caudal femur.
Kerrville, Texas	33	4.9	23.5	19.5
Kerrville, Texas	35.5	5.3	24.3	20
Cisco, Texas	33.1	4.8	23.3	18.9
Cisco, Texas	37.7	5.8	26.5	22
Amarillo, Texas	32	4.9	22.5	18.1
Amarillo, Texas	32.5	4.9	22.4	19
Marathon, Texas	30.6	4.6	21	17
Marathon, Texas	35.6	5.5	24.8	21
Sycamore Canyon, Baboquivari Mountains, Arizona	31.3	5	22	18.2
Sycamore Canyon, Baboquivari Mountains, Arizona	37	5.7	27.4	21
♀				
Hot Springs, South Dakota	36.5	6	23	20
Havana, Illinois	38.6	5.5	24.8	21
Hamburg, Iowa	43.7	7	28.3	24.2
Hamburg, Iowa	44	7	30.5	—
Southwestern Nebraska	41.2	6.3	26	26.8
Southwestern Nebraska	41.2	6.2	29	22.4
Dodge City, Kansas	40.2	6.1	28	23.4
Dodge City, Kansas	39.7	6	27	23
Syracuse, Kansas	39.8	6.9	29.2	23.4
Syracuse, Kansas	50	7.5	31.6	27.4
Dallas, Texas	45	7.2	31	26.2
Dallas, Texas	52	7.8	33.4	28.8
Kerrville, Texas	47.2	7	30.6	24
Cisco, Texas	46.6	6.5	30	25.3
Cisco, Texas	52.2	7.5	34	26.9
Amarillo, Texas	45	6.8	30	25.2
Marathon, Texas	44.2	6.5	38.3	25.3
Marathon, Texas	51.2	7.6	32.2	26.4
Northeastern New Mexico (*type*)	37.3	7	25.5	22.4
Sycamore Canyon, Baboquivari Mountains, Arizona	50.5	8	33	26.2
Sycamore Canyon, Baboquivari Mountains, Arizona	51	7.8	33.2	26.9

From these measurements it is quite apparent that the species shows minimum size at the more northern and more eastern localities and the maximum size southward, at least as far as its distribution within the United States is concerned. Immediate environment appears to us to be an extremely potent factor in influencing the size of individuals, those from the relatively poorly grassed Great Plains regions being of small size, excepting when from the more heavily carpeted swales and valleys. The material from the Illinois sand areas, the most eastern locality known for the species, is of very small size, well illustrating the response of the species to a rather unfavorable environment. The optimum size development of the species is reached in northeastern Texas and south-central Oklahoma, with grassland areas of western Texas (Marathon) and southern Arizona (Sycamore Canyon), following in the large size of their representatives.

Color Notes.—The species shows a decided amount of variation in both general tonal color and pattern. It has well marked green and brown phases, which are generally clearly distinct, but occasionally brownish specimens will show some element of the green phase, such as the green humeral stripe. The male sex is predominatingly brown phase, the green phase being relatively scarce in that sex, hardly one-tenth of the series of males being in the greenish phase. The female sex is predominatingly green phase, about two-thirds of the female specimens examined representing that type. Our environmental data is not sufficient to warrant any statement as to the correlation of the color tones and the environment, as the information in part contradicts what would be the general assumption regarding such correlation.

The tone of the green base color varies from light chalcedony yellow (in an apparently teneral individual) through light grape yellow and yellowish citrine to courge green on the head, pronotum, pleura and caudal femora, while the humeral bar on the tegmina is always more nearly approaching one of the shades of malachite green. The Baboquivari individuals have a base color ranging from dull mustard yellow to wax yellow, with more or less distinctly marked malachite green humeral bars on the tegmina.

The tone of the brown base color varies from light ochraceous-buff through ochraceous-tawny and tawny to cinnamon-brown, in the latter condition often largely overcast with hoary white except at the normal dark bars.

The lateral postocular bars range in depth from snuff brown (teneral specimen) through kaiser brown and chestnut brown to mummy brown. The postocular bars are almost invariably well marked. A medio-longitudinal bar on the head and pronotum is occasionally (♀) or generally (♂) present, again just intimated, very rarely strongly pronounced in the female sex (one only, from Baboquivari Mountains, Arizona) and infrequently indicated only by arcuate lines of color. In numerous specimens the median carina of the pronotum is finely lined with the color of the postocular bars, but no median bar will be marked on the head or otherwise on the pronotum. This condition is connected up by numerous specimens with the uniform medio-longitudinal bar pattern.

The tegmina vary in the degree of contrast between their base color and the humeral bar. This variation, and also the degree

of contrast of the paler lining of the immediate anal angle, is much as in the other species of the genus. The depth of the coloration of the caudal tibiæ is gauged by the general tone and pattern. It may be as dull as cameo brown (very dark and recessively colored female from the Illinois sand region), as light as coral red or as rich as scarlet. The latter condition is indicated only in Baboquivari Mountains, Arizona, specimens.

The small Baboquivari Mountains series is much more brilliant in coloration and averages more lineate (i. e., high percentage with medio-longitudinal bar) than any others. What Mearns has said of the mammals of an adjacent portion of the United States and northern Mexico can be noted in relation to the intensity of coloration in these individuals. "Increased intensity of coloration characterizes the mammals from the valleys containing the terminal streams of the great Yaqui River of Mexico, some of which rise on the United States side of the Boundary."[24] We hope to have more to say in the near future regarding the intensification of color tones and increase in contrast of patterns in Orthoptera from certain sections of the Mexican Boundary region.

Distribution.—The range of this species extends from the Yellowstone and Missouri Rivers region of eastern Montana and western North Dakota, south to central (Kerrville) and western (Chisos Mountains) Texas and northern Durango (Villa Lerdo), Mexico; east to north-central Illinois (vicinity of Havana and Bishop), southwestern Iowa (Hamburg), eastern Oklahoma (Cherokee Nation) and central northern Texas (Dallas region); west to southern Montana (Little Big Horn River), west-central Colorado (Clear Creek Canyon) and southern Arizona (Baboquivari Mountains). The latter region is separated from the other localities from which the species is known by an interval of about five hundred miles. This striking isolation of the Baboquivari material would be extraordinary, if it were not shared by a number of other steppe species having a similar range. The explanation of this type of distribution is yet to be found. The occurrence of areas of tall grass is, however, a controlling factor within the range of the species.

The vertical range of this species extends from at least as low as 430 feet (Dallas, Texas) to as high as 9000 feet (mouth of Clear Creek Canyon, Colorado). In Texas alone, the vertical range is definitely known to be from the minimum given above to at least

[24] Bull. 56, U. S. N. M., p. 74, (1907).

4485 (Alpine) and 4500 to 5000 (Moss Well) feet. In Oklahoma it has been reported from as low as 1275 feet (Cache), while in Colorado (within its range) it occurs as low as 3460 feet (Julesburg).

Biological Notes.—Morse has very truthfully and concisely given this species as "characteristic of the coarse grasses of the drier parts of the prairie plains and * * often locally abundant." It is, however, quite at home on hills and slopes, even being considered by Bruner to be partial to hill-tops, while Gillette states it is found both within and without the foothills at Fort Collins. Hart reports it on bunch grass (*Panicum virgatum*) in blowouts between sand dunes in the Illinois sand areas, while in our experience it occurred in a variety of situations, even within the zone of oaks in the Baboquivari Mountains, Arizona, at 6000 feet elevation. The necessary requirement for its presence is a sufficient area of coarse grass, which is as attractive when sun-cured as it is when fresh. It is often taken in company with *M. maculipennis macclungi*, but is more local and generally less abundant.

The earliest exact date we have for adults is July 29 (Julesburg), although material taken that month, without exact date, from Little Big Horn River, Montana, and Chisos Mountains, Texas, is now before us. The latest date we have record of is October 6 to 9 (Sycamore Canyon, Baboquivari Mountains, Arizona). That the species persists late at relatively northern localities is evident, as we have October material, without exact date, from Hot Springs, South Dakota. Adult material taken at Dallas, Texas, on August 14 to 16 was accompanied by immature individuals, also adult males and immature females were secured at Marathon, Texas, on August 20, so it is evident that the species does not mature very much earlier southward than it does northward. Morse, in his work in Texas and Oklahoma, secured no adults before August 15 (Wichita Falls, Texas), although he had taken immature material on August 8 (Caddo, Oklahoma) and again on August 18 (Clarendon, Texas). Hart has reported immature specimens taken in Illinois on August 17 and adults on August 18 to 20. Identifiable immature material has been recorded by other authors, or is now before us, taken as early as July 3 (Clear Creek Canyon, Colorado) and as late as September 5 to 8 (Moss Well, Chisos Mountains, Texas). No adults were taken with the latter.

Remarks.—This species is, when due allowance is made for the variation found in all of the forms of the genus, a very plastic

one, apparently responding readily to environmental influences, in modifications of both structure and coloration. None of these tendencies, however, seem well enough established or as constant as would be required of such differential features to form adequate bases for naming geographic races. The southern Arizonan (Baboquivari Mountains) material is the more strikingly isolated of these, in its generally blunter fastigium, somewhat more robust form and prominent coloration features. However, as we have shown above, this material itself varies appreciably, and is virtually connected with the more normal condition by a number of individuals from component series of the representation before us. Until we know more concerning the species in the southwestern portion of its range, its variation there and the geographic extent of the tendencies shown by our small Baboquivari series, it is inadvisable to propose a racial name for this material. The future may show the desirability of such action, but at this writing the evidence does not warrant it.

Specimens examined: 248; 152 males, 87 females, 2 immature males, 7 immature females.

Illinois: Havana, Mason County; (J. D. Hood); 1 ♂, 1 ♀; [U. S. N. M.]. Bishop, Mason County; VIII, 13, 1907; 1 ♂; [Ill. State Lab. Nat. Hist.].

Iowa: Hamburg, Fremont County; IX, 2, 1914; (M. P. Somes); 2 ♀; [Somes Cln.].

South Dakota: Hot Springs, Fall River County; X, 1888 (one specimen); 1 ♂, 1 ♀; [Hebard Cln.].

Nebraska: Sidney, Cheyenne County, elevation 4100 to 4300 feet; VII, 30, 1910; (R. & H.; on top and slopes of bluffs of Lodge Pole Creek); 2 ♂. Southwest Nebraska; 2 ♀; [Hebard Cln.].

Kansas: Hill City, Graham County; 1910; (C. E. McClung); 1 immature ♂; [McClung Cln.]. Graham County; (C. E. McClung); 1 ♂, 1 ♀; [McClung Cln.]. Russell, Russell County; (C. E. McClung); 2 ♂, 1 ♀; [McClung Cln.]. Dorrance, Russell County; 1908; (C. E. McClung); 2 ♂; [McClung Cln.]. Wilson, Ellsworth County; 1910; (Pinney); 1 ♂; [McClung Cln.]. Wellington, Sumner County; (E. G. Kelly); 1 ♂; [Somes Cln.]. Dickinson County; 1908; (Robertson); 3 ♂; [McClung Cln.]. Richmond, Franklin County; 1910; (Taylor); 1 ♂; [McClung Cln.]. Kingman, Kingman County; 1911; (E. Carothers); 1 ♂; [McClung Cln.]. Barber County; (F. W. Cragin); 1 ♂, 3 ♀; [Hebard Cln.].[25] Dodge City, Ford County, elevation 2500 feet; IX, 13, 1909; (H.; very plentiful in areas of short grass); 10 ♂, 2 ♀. Syracuse, Hamilton County, elevation 3230 feet; IX, 12, 1909; (R. & H.; in short prairie grass); 3 ♂, 12 ♀.

[25] Previously recorded by Bruner.

Oklahoma: Mountain Park, Tillman County, elevation 1360 to 1390 feet; VIII, 22, 1905; (A. P. Morse); 1 ♂; [Morse Cln.].[26] Summit of Mount Sheridan, Wichita Mountains, Comanche County, elevation 2500 feet; VIII, 24, 1905; (A. P. Morse); 1 ♂; [Morse Cln.].[26] Cache, Comanche County, elevation 1275 feet; VIII, 25, 1905; (A. P. Morse); 1 ♂; [Morse Cln.].[26] Cherokee Nation; VIII, 1896; 1 ♀; [U. S. N. M.].[27]

Texas: No exact locality; (Belfrage); 2 ♂; [U. S. N. M.]. Amarillo, Potter County, elevation 3600 feet; VIII, 20, 1905; (A. P. Morse); 2 ♂, 1 ♀; [Morse Cln.].[26] Wichita Falls, Wichita County, elevation 950 feet; VIII, 15, 1905; (A. P. Morse); 1 ♂; [Morse Cln.].[26] Dallas, Dallas County, elevation 430 feet; VIII, 14 to 16, 1915; (R.; common in grasses in prairie region, immature individuals very common, female adults not numerous); 35 ♂, 7 ♀; 1 immature ♂, 4 immature ♀: IX, 25 to 26, 1912; (R. & H.; scarce in areas of tall grass); 8 ♂, 4 ♀: IX, 3 (one specimen); (Boll); 2 ♂, 3 ♀; [U. S. N. M. and M. C. Z.]. Sagamore Hill, Tarrant County, elevation 650 feet; IX, 27, 1912; (R. & H.); 2 ♀. Weatherford, Parker County, elevation 1000 to 1100 feet; IX, 23, 1912; (R. & H.); 1 ♀. Cisco, Eastland County, elevation 1450 to 1550 feet; IX, 21 to 22, 1912; (R. & H.; in grasses along stream and in meadows, locally more common than *M. maculipennis maculipennis*, with which it was associated); 12 ♂, 18 ♀. Kerrville, Kerr County, elevation 1525 to 1800 feet; VIII, 17 to 18, 1912; (R. & H.; scarce in low scant grass about low oak thickets); 2 ♂, 1 ♀. Marathon, Brewster County, elevation 3940 to 4160 feet; VIII, 20, 1916; (R.; uncommon in moister areas); 2 ♂, 2 immature ♀: VIII, 25 to 27 and IX, 12 to 13, 1912; (R. & H.; in high grasses); 35 ♂, 13 ♀. Chisos Mountains, Brewster County; VI, 1911; (H. A. Wenzel); 1 ♂; [A. N. S. P.]. Moss Well, Chisos Mountains, Brewster County, elevation 4500 to 5000 feet; IX, 5 to 8, 1912; (R. & H.); 1 immature ♀. Alpine, Brewster County; IX, 8, 1911; (F. C. Bishopp); 1 ♂; [U. S. N. M.].

Montana: Little Big Horn River; VII, 1883; 1 ♂; [U. S. N. M.].[28]

Colorado: Julesburg, Sedgwick County, elevation 3460 to 3550 feet; VII, 29, 1910; (R. & H.; on scantily grassed hills); 1 ♂, 1 ♀. Holly, Prowers County; IX, 8, 1898; (C. P. Gillette); 1 ♂, 1 ♀; [Hebard Cln.]. La Junta, Otero County, elevation 4150 feet; IX, 11, 1909; (R. & H.; not common on poorly grassed broken limestone surface at edge of Great Plains plateau); 4 ♂, 5 ♀.

Arizona: Baboquivari Mountains, Pima County; (F. H. Snow); 2 ♂; [A. N. S. P.].[29] Sycamore Canyon, Baboquivari Mountains, Pima County, elevation 3700 to 6000 feet; IX, 6 to 9, 1910; (R. &

[26] Previously recorded by Morse.
[27] Previously recorded by Caudell.
[28] This specimen is labelled "Little Horn River," which is doubtless meant to be Little Big Horn River
[29] Previously recorded by Rehn.

H.; on grassy benches of canyon slopes to tops of ridges and, very rarely, in tall yellow grass in the zone of oaks); 6 ♂, 4 ♀.

Mermiria alacris Scudder.[30] Plate V, figs. 28 35; Plate II, figs. 1-4.

1877. *Mermiria alacris* Scudder, Proc. Boston Soc. Nat. Hist., xix, p. 30. [♂, ♀ : Georgia.]
1897. *Mermiria rostrata* McNeill, Proc. Davenp. Acad. Nat. Sci., vi, pp. 205, 207, pl. I, fig. 3c. [♂, ♀ : Mackay, Oklahoma (Indian Territory).]
1899. *Mermiria vigilans* Scudder, Proc. Amer. Acad. Arts and Sci., xxxv, pp. 42, 43. [♂, ♀ : Smithville, North Carolina]

Comparison with *M. neo-mexicana*, the only close ally of the present species, has already been made under that form.

This species was based on a series of thirty-two males and two females, collected in "Georgia" by H. K. Morrison. Of these we have examined nineteen males and one female, all in the Scudder Collection at the Museum of Comparative Zoology with the exception of one male in the United States National Museum. We here select a single male as the lectotype.

Single Type (by present selection).—♂; Georgia. "Type specimen." "Mermiria alacris Scudd." [Scudder Collection in Museum of Comparative Zoology.]

Morphological Notes.—The striking morphological variational feature seen in this species is that most noticeable in the other species of the genus, *i. e.* the form of the fastigium. This variation is spread over the whole distribution of the species and not confined to any one region or sex. In the more rounded type the fastigium forms a rounded, approximately 70° (♀) or 65° (♂) angle, from which the variations range through all degrees of production and rounding to 42° (♀) or 33° (♂). The character of the lateral margins of the fastigium varies independently of the exact angle, being weakly arcuate to straight. The exact outline of the dorsum of the head, when seen from the side, the degree of decurving of the fastigial line, the exact form of the outline of the eye and the exact location of the fastigial impression are all variable and, apparently, always individually. The eyes show similar extremes of this variation to those occurring in *intertexta*, while the presence or absence of the weak fastigial medio-

[30] The immature material from Nugent, Mississippi, recorded by Morse as *Mermiria bivittata* (Carneg. Inst. Wash. Publ., No. 68, p. 28, (1907)), represents, instead, the present species. The adult material there recorded is, however, true *bivittata*. It is highly probable that the immature specimens recorded at the same time from Biloxi and Hattiesburg, Mississippi, also represent *alacris*, as *bivittata* is, apparently, an earlier maturing species, but we have only immature material from Nugent, kindly loaned by Prof. Morse, before us.

longitudinal carina has no taxonomic significance. McNeill's *rostrata* was based on individuals with the very acute fastigium, but the extensive material now before us shows this condition to be purely individual.

Synonymy.—The synonymy given above is very evident to anyone having before them the typical material of the "species," or even topotypic males. Morse[31] and Rehn and Hebard[32] have already established the synonymy of *vigilans*, which further study has fully confirmed. McNeill's *rostrata* has been the subject of considerable study, particularly as nearly topotypic material showed in part a more acute fastigial form than the average of *alacris*. A careful analysis of the extensive series before us, covering the whole known range of *alacris*, shows clearly and most convincingly that similarly very acute fastigii are found at practically every locality represented by a fair series, and also that Oklahoma and north Texas material is as variable, in this respect, as that from other regions. The variation in the Oklahoma and Texas individuals embraces types with the fastigial angle as rounded as in the more average eastern material. The whole range of fastigial variation is similar to and co-extensive with that occurring in all the other species of the genus. The other features given as diagnostic of *alacris* and *rostrata* by McNeill are variable and untrustworthy. That author had but five specimens of the two "species" before him at the time, so there is little wonder he was led to assign erroneous values.

Measurements (in millimeters).

♂	Length of body.	Length of pronotum.	Length of tegmen.	Length of caudal femur.
New Berne, North Carolina	35.3	6	28	22
New Berne, North Carolina	37.2	6	26	20
Southern Pines, North Carolina	28	4.8	20.8	17.4
Southern Pines, North Carolina	34	5.4	25.2	19.6
Winter Park, North Carolina	32.2	5.2	22.8	18
Winter Park, North Carolina	37	5.7	25.7	21.2
Seven Mile, South Carolina	36	6.1	26	21.2
Seven Mile, South Carolina	39.4	6.5	26.7	21.2
Groveland, Georgia	37	5.3	25.1	19.6
Groveland, Georgia	39	5.6	27.3	22
Bainbridge, Georgia	34	5.4	25	18.8
Bainbridge, Georgia	37	5.4	26.5	19.5
Jacksonville, Florida	35	5	24	19.5
Jacksonville, Florida	36	6	27	20.5
Pomona, Florida	36.2	6.1	26.5	20.9

[31] Carneg. Inst. Wash., Publ. No. 68, p. 27, (1907).
[32] Proc. Acad. Nat. Sci. Phila., 1916, p. 156, (1916).

	Length of body.	Length of pronotum.	Length of tegmen.	Length of caudal femur.
Pomona, Florida	39.5	6.4	28.5	22.4
Gainesville, Florida	35.5	5.2	24.6	19.2
Cedar Keys, Florida	34.6	5.2	25	18.4
Fort Myers, Florida	32.5	5	23.6	18
Fort Myers, Florida	38	5.7	26	21
DeFuniak Springs, Florida	37.5	5.8	26.5	21.5
DeFuniak Springs, Florida	38.3	5.7	28.2	20.4
St. Elmo, Alabama	39.8	6	26.2	21
St. Elmo, Alabama	42	6.5	29.8	21.4
Alexandria, Louisiana	36.2	5.7	25.3	21.2
Alexandria, Louisiana	37	5.7	27.3	21
Elkhart, Texas	37	6	27	21.6
Elkhart, Texas	40	6.4	28.4	22.9
Dallas, Texas	37	5.3	27.7	20.3
Dallas, Texas	40.5	6.4	29.6	23.1
Shawnee, Oklahoma	39.6	6.2	27.2	21.7
Waurika, Oklahoma	36	5.6	26.4	20.4
Hollister, Missouri	33.5	5.2	23.4	18.9
♀				
New Berne, North Carolina	48.2	8	34	26.5
Southern Pines, North Carolina	40.2	6.5	30	22.5
Southern Pines, North Carolina	46.3	7.4	34	25.2
Winter Park, North Carolina	47	7.8	34	25.4
Winter Park, North Carolina	52.8	8	35.5	26.2
Seven Mile, South Carolina	52.2	8.6	36	26.8
Seven Mile, South Carolina	52.7	9.2	37.3	29.2
Groveland, Georgia	55	8.4	35	26.5
Bainbridge, Georgia	45	7.5	31	25.4
Bainbridge, Georgia	49.2	7.7	34.5	27
Jacksonville, Florida	51.6	8	35.2	27.6
Jacksonville, Florida	53.5	8.3	35.8	26.5
Pomona, Florida	47.5	7.7	34	27.7
Pomona, Florida	53.1	8.8	35.6	28.8
Titusville, Florida	52.3	8.2	[33]	27.7
Fort Myers, Florida	51.4	8	36.5	27.5
Fort Myers, Florida	50.5	8	35.2	28.1
DeFuniak Springs, Florida	50	8.2	36.2	27.7
Irvington, Alabaaa	47.3	7.8	34.8	27.7
Irvington, Alabama	53.5	8.9	38.2	29
Alexandria, Louisiana	47.6	7.4	34.5	26.5
Alexandria, Louisiana	47.3	7.6	32.9	25.6
Dallas, Texas	47.5	7.5	32.4	23.8
Dallas, Texas	50	8.4	34.6	26.5
Wilburton, Oklahoma	51.5	7.9	36	27
Stillwater, Oklahoma	44.2	7.5	31	24.4
Hollister, Missouri	45.5	7	31	23.6

These measurements of extremes show there is a great amount of variation at single localities, in both sexes, but particularly in the male sex. The optimum size development of the species is found in the low coastal region of the Carolinas, and in the north Floridian and Gulf Coast regions between Jacksonville and southern Mississippi, although the material continues well above average size into northeastern Texas and eastern and south-central

[33] Damaged.

Oklahoma. The minimum is found in material from the northern limits of the range and inland from the eastern coast, at what is the interior limit of the species in that region. The peninsular Florida individuals show, as a whole, a faint reduction in size compared with north Floridian specimens.

Color Notes.—The coloration of this species is distinctive when compared with most of the others in the genus, although certain individuals of *neo-mexicana* are very similar. The latter can, however, be readily distinguished by the structural characters. The base color in *alacris* ranges from dull lemon chrome to oil yellow and courge green, rarely as dull as sulphine yellow (only in the material from Elkhart, Texas), the abdomen always clearer, purer and more decidedly yellow. The dark bars range in tone from dragon's-blood red to garnet brown, rarely to liver brown and chestnut-brown. The dark markings on the head and pronotum may be of similar depth or those on the head may be distinctly paler and less sharply marked. The usual dark medio-longitudinal line on the head, pronotum and sutural margins of the tegmina may be strongly and uniformly marked, in fact almost as decided as the lateral bars, may be obsolete on the head yet distinct on the pronotum, or may be completely absent except for a narrow lining along the median carina of the pronotum. We find that the maximum reduction of the medio-longitudinal bar is generally accompanied by a slight weakening of the lateral bars, i. e., the specimens having rudimentary medio-longitudinal bars show relatively weaker lateral bars. The tegminal continuation of the dark bar is broad and unbroken by a pale humeral line in one extreme condition, while in the other extreme the dark bar on the proximal portion of the tegmina is narrower than the humeral pale line, and distad it is weaker and suffuses but about one-half of the width of the discoidal field. The face varies from uniformly pale, except for dark lines along the lateral facial carinæ, to uniformly suffused with the color of the dark pattern. The creamy white edgings of the dark lateral head and pronotal bars, the ventral edging of the continuation of the same on the pleura and the line at the ventral edge of the genæ, pronotum and ventrad on the pleura vary in distinctness. The immature specimens show a green or (rarely) brown phase with the dark bars indicated and enclosed between cream-colored callose lines.

The palest material seen is from Alexandria, Louisiana, while specimens from Pass Christian, Mississippi, strongly approach

the Alexandria ones. The Elkhart, Texas, series is very deeply but dully colored, while the single Waurika male is also very dull. From central-northern Florida (Woodville) and southwestern Georgia (Bainbridge) westward in the Gulf Coast region the species averages paler, and with lighter greens than it does along the eastern coast from North Carolina south into peninsular Florida.

Distribution.—In the east the range of this species extends from as far north as central North Carolina (Salisbury and New Berne), south to south-central Florida (Iona, Fort Myers and Okeechobee, St. Lucie County), the Gulf Coast of western Florida, Alabama, Mississippi and interior Louisiana; west to northeastern Texas (Dallas, Longview and Elkhart), northwestward to central Oklahoma (Perkins, Stillwater, Shawnee and Waurika) and extreme southeastern Kansas (Independence), north in the Mississippi Valley to southern Missouri (Hollister). In the east it occurs chiefly below the Fall-line in the Coastal Plain, but immature material, clearly of this species, has been taken at Toccoa, Georgia, over one thousand feet elevation, and at Salisbury, North Carolina, while we have examined one adult from Clemson College, South Carolina, which is at an elevation of eight hundred and fifty feet. The northern limit of the species' distribution in Alabama and Mississippi remains to be determined; we feel confident, from our field experience, that it is either absent or extremely scarce in southwestern Louisiana and southeastern Texas.

The presence of areas of long- and short-leaf pine appears to exercise a decided influence on the distribution of this species, although it occurs to the northwest of the range of these trees in Oklahoma.

Biological Notes.—This beautiful species frequents tall grass in long- or short-leaf pine woods of rolling or flat woods type, or mixed woods; occasionally in wet woods or along the borders of swampy timbered areas. It also occurs in associated gallberry and similar bushes in its preferred environment, and persists in grasses and oak sprouts after the higher covering forest has been removed. Rarely it appears to invade old fields growing up in grasses and bushes, and rather infrequently is found in sandy barrens of low oak and pine, where it occurs in the scant grass and oak sprouts. It is a moderately strong flier and is quite adept at dodging, its conspicuous coloring not rendering it as evident as would be imagined.

The earliest date available for adults is July 16 to 29, at Spring Creek, Georgia, while an adult was taken at Augusta, Georgia, on the latter date and several others at Albany, Georgia, on August 1. We have also seen an adult specimen labelled July, taken at Billy's Island, Georgia. The Spring Creek, Augusta, and Billy's Island specimens were secured with immature specimens of the species, the latter representing two instars in each case, all being in the two instars preceding maturity excepting the immature individuals from Billy's Island, which were chiefly taken in June and much less advanced. June is the earliest month noted for the immature condition, and we have material (females in the instar preceding maturity) taken with adult individuals as late as September 13 to 15. We have seen no immature specimens taken later than August 18 (Longview, Texas) which are not in the instar immediately preceding maturity. The latest date known for adults is November 22, at Smithville, North Carolina. We have seen specimens taken during the same month at Southern Pines, North Carolina, and Titusville, Florida, while the species occurs at the most western known locality (Waurika, Oklahoma) as late as October 14. The earliest northern date for adults is August 4, at Southern Pines, North Carolina, so it is evident the species has a mature season of over three months at its northern limit of distribution in the east.

Specimens examined: 203; 134 males, 55 females, 2 immature males, 12 immature females.

North Carolina: Southern Pines, Moore County; VIII, 4 to 25, X, 13, 1915; (A. H. Manee); 17 ♂, 6 ♀; [Hebard Cln.].

South Carolina: Clemson College, Oconee County; IX, 1 to 2, 1905; 1 ♂; [Somes Cln.]. Lane, Williamsburg County; VII, 20, 1917; (M. Hebard: in grasses in long-leaf pine woods); 1 immature ♂, 2 immature ♀; [Hebard Cln.]. Seven Mile, Charleston County; IX, 23, 1917; (R. & H.; occasional in pine woods); 6 ♂, 4 ♀.

Georgia: Groveland, Bryan County; IX, 21, 1917; (R. & H.; infrequent in undergrowth of sandy oak barrens); 5 ♂, 1 ♀. Bainbridge, Decatur County; IX, 5 to 6, 1915; (R. & H.; occasional in undergrowth of pine and oak woods, particularly in the more grassy areas); 9 ♂, 7 ♀, 1 immature ♀.

Florida: Ocala, Marion County; IX, 19 to 20, 1917; (R. & H.; in sandy barrens and undergrowth of sandy pine and oak flatwoods); 1 ♂, 3 ♀. Pomona, Putnam County; IX, 7 to 8, 1917; (R. & H.; in undergrowth in pine woods); 2 ♂, 2 ♀. Dunnellon, Marion County; IX, 19, 1917; (R. & H.; rare in pine woods undergrowth); 1 ♀. Kissimmee, Osceola County; IX, 10, 1917; (R. &

H.; along edge of cypress bay); 3 ♂. Lakeland, Polk County; IX, 11, 1917; (R. & H.; few in pine woods undergrowth); 1 ♂, 1 ♀. Iona, Lee County; IX, 13, 1917; (R. & H.; in pine woods undergrowth); 1 ♀, 1 immature ♀. Fort Myers, Lee County; IX, 13 to 15, 1917; (R. & H.; in pine woods); 7 ♂, 2 ♀, 1 immature ♀. Okeechobee, St. Lucie County; VII, 1915; (M. Mickle); 1 immature ♀; [Hebard Cln.]. Woodville, Leon County; IX, 1, 1915; (R. & H.; moderately numerous in wire grass in long-leaf pine woods and in oak sprouts); 9 ♂, 3 ♀. Carrabelle, Franklin County; IX, 2 to 3, 1915; (R. & H.; few in grasses on edge of swampy wooded areas); 5 ♂, 2 ♀. River Junction, Gadsden County; VIII, 31, 1915; (R. & H.; few in long-leaf pine woods); 4 ♂. Grand Ridge, Jackson County; IX, 1, 1915; (R. & H.; in wire grass in long-leaf pine woods); 1 ♂. DeFuniak Springs, Walton County; VIII, 30, 1915; (R. & H.; moderately common in wire grass in long-leaf pine woods); 11 ♂, 2 ♀, 1 immature ♀. Pensacola, Escambia County; VIII, 28 to 29, 1915; (R. & H.; occasional in heavy wire grass, ground oak, etc., in long-leaf pine woods); 7 ♂, 2 ♀, 2 immature ♀.

Alabama: Montgomery, Montgomery County; IX, 8, 1915; (H.; in coarse grasses in park-like short-leaf pine woods on ridges); 1 ♀. Mobile, Mobile County; VIII, 26 to 27, 1915; (R. & H.; in tall grasses in long-leaf pine flat-woods); 3 ♂. Irvington, Mobile County; VIII, 26, 1915; (R. & H.; moderately common in grasses of deforested pine flat-woods); 4 ♀. St. Elmo, Mobile County; VIII, 26, 1915; (R. & H.; moderately common in heavy grasses in long-leaf pine flat-woods); 6 ♂, 2 ♀, 1 immature ♀.

Mississippi: Hattiesburg, Forest County; IX, 11, 1915; (R. & H.; in rolling, rather open long-leaf pine flat-woods); 3 ♂, 1 ♀. Pass Christian, Harrison County; VIII, 23, 1915; (R. & H.; one colony in high grasses in swampy pine woods); 3 ♂.

Louisiana: Alexandria, Rapides Parish; VIII, 22, 1915; (R. & H.; very locally common in tall grasses of rather open long-leaf pine-woods); 12 ♂, 2 ♀.

Texas: Longview, Gregg County; VIII, 18, 1915; (R. & H.; in short-leaf pine woods); 1 immature ♀. Elkhart, Anderson County; VIII, 16, 1915; (H.; in tall grass patches along border of woods, chiefly short-leaf pine); 11 ♂, 1 immature ♂, 1 immature ♀. Dallas, Dallas County; IX, 10 (on two specimens); (Boll); 3 ♂, 2 ♀; [M. C. Z.[34] and U. S. N. M.].

Oklahoma: No exact locality; (Ray Painter); 1 ♂, 1 ♀; [U. S. N. M.]. Wilburton, Latimer County; VIII, 27, 1905; (A. P. Morse); 1 ♀; [Morse Cln.].[35] Shawnee, Pottawatomie County; VIII, 26, 1905; (A. P. Morse); 1 ♂; [Morse Cln.].[35] Stillwater, Payne County; (A. N. Caudell); 1 ♀; [U. S. N. M.].[36] Perkins,

[34] The two males and one female from the Scudder Collection [M. C. Z.] are labelled "neomexicana" in Scudder's handwriting. They are clearly *alacris*.

[35] Reported by Morse, Carneg. Inst. Wash., Publ. 68, p. 27, (1907).

[36] Reported by Caudell, Trans. Amer. Entom. Soc., xxviii, p. 84, (1902).

Payne County; VIII, 13, 1901; (N. Caudell); 1 ♀; [U. S. N. M.]. Waurika, Jefferson County; X, 14, 1909; (F. C. Bishopp); 1 ♂; [U. S. N. M.].

Kansas: Independence, Montgomery County; VIII to IX, 1902; (A. Birchfield); 1 ♀; [U. S. N. M.].

Missouri: Hollister, Taney County; VIII, 1909 and 1913; (M. P. Somes); 1 ♂, 1 ♀; [Somes Cln.].

Rehn and Hebard have recorded the species from the following localities: Fayetteville, New Berne, Southern Pines, Wilmington, Winter Park, Wrightsville and Lake Waccamaw, North Carolina; Columbia, Ashley Junction and Yemmassee, South Carolina; Toccoa, Augusta, Macon, Jesup, Billy's Island, Albany, Bainbridge and Spring Creek, Georgia; Jacksonville, Pablo Beach, San Pablo, Gainesville, Cedar Keys, and Titusville, Florida.

Mermiria intertexta Scudder. Plate VI, figs. 5-14.

1897. *Mermiria bivittata* McNeill (in part), Proc. Davenp. Acad. Nat. Sci., vi, pp. 204, 205. [Apparently the single Virginia record applies to this species.]

1899. *Mermiria intertexta* Scudder, Proc. Amer. Acad. Arts and Sci., xxxv, pp. 41, 42. [♂, ♀: Georgia; Eagle Pass, Texas.]

1904. *Mermiria intertexta* Bruner, Biol. Cent.-Amer., Orth., ii, p. 39. [Eagle Pass, Texas.]

This striking species occupies a rather intermediate position between the two types of the genus, having appreciable, though not strongly marked, lateral carinæ on the dorsum of the pronotum, yet lacking supplementary carinæ on the lateral lobes of the pronotum. The form is very elongate, with the pronotum unusually elongate, yet regularly, though weakly, enlarging caudad. The species is entirely hygrophilous, and as far as known, found only on the eastern and Floridian coasts.

Type.—♂; Georgia. (Morrison.) [Scudder Collection.] *Allotype.*—♀; same data.

The species was based on two males and two females from Georgia and Eagle Pass, Texas (Schott), all in the Scudder Collection. Of these we have examined two males and one female from the former locality.[37]

The present species, like *M. texana*, is so sharply defined from the other forms of the genus that, with the basic differential fea-

[37] We have not had an opportunity recently to examine the single female recorded from Eagle Pass, Texas. There is every reason to suppose it belongs to *M. maculipennis maculipennis*, and has nothing to do with the present species, which, in habitat, is absolutely foreign to that locality. The specimen recorded by Caudell (Mus. Brooklyn Inst. Arts and Sci., Sci. Bull., i, p. 110, (1904)) from the Brownsville region, Texas, as this species, is now before us, and, as we had suspected, represents *M. maculipennis maculipennis*.

tures of the species in mind, *intertexta* will not be confused with any other, while its hygrophilous tendencies also serve as an additional aid to its recognition.

Morphological Notes.—In every series of any size of this species we find the most striking extremes in the variation in the outline of the fastigium, particularly of the males. We have figured the extremes of that sex of two series, which will show more graphically than words the variability in the production, degree of angulation or roundness of the outline of the fastigium. The greater or lesser degree of projection of the fastigium has, of course, an evident influence on the form of the fastigio-facial angle, when seen from the side, and with this is correlated some variation in the shape of the basal outline of the eye, the dorso-cephalic section being more strongly acute angulate in those with the fastigium more produced, and more produced rounded in those with the fastigium relatively shorter. Aside from this, however, the form of the eyes varies decidedly and entirely individually, the greatest width contained in one extreme one and one-half times in the greatest depth of the same, and in the other extreme one and three-quarters times in the greatest depth. Considerable individual variation in the width and relative depth of the sulcation of the frontal costa is evident in the series, this being purely individual.

Measurements (in millimeters).

♂	Length of body.	Length of pronotum.	Length of tegmen.	Length of caudal femur.
Anglesea, New Jersey	32	5.1	23	18.6
Anglesea, New Jersey	31.7	5	22.3	17.8
Cape May, New Jersey	30	5	22.5	17.7
Cape May, New Jersey	34.1	5.7	24	18.4
Millenbeck, Virginia	33.5	5.6	25.2	21
Wrightsville, North Carolina	39	5.8	27.3	22
Isle of Palms, South Carolina	37.7	6	25	20.9
Tybee Island, Georgia	36	5.6	26.2	20.5
Tybee Island, Georgia	42.5	6.9	29	22.7
Pablo Beach, Florida	26.3	5.6	25.9	20
Pablo Beach, Florida	40.7	6	28.8	21.9
Homestead, Florida	35.1	5.7	25.3	19.7
Homestead, Florida	39.5	6	27.5	21.2
Big Pine Key, Florida	32.3	5	24	18.7
Big Pine Key, Florida	36.7	5.9	26.4	21.5
Indian Beach, Florida	42	7	29.5	24.5
Indian Beach, Florida	40.6	6.4	27.8	22.6
Cedar Keys, Florida	36.5	5.5	25.5	22.3
Cedar Keys, Florida	38.2	5.8	25	20.5
♀				
Anglesea, New Jersey	46.5	8	32.5	26
Anglesea, New Jersey	47.3	8	34.2	26.9

	Length of body.	Length of pronotum	Length of tegmen.	Length of caudal femur.
Cape May, New Jersey	46.5	7.6	33.3	25.3
Cape May, New Jersey	48.6	8.7	34.6	28
Millenbeck, Virginia	40.5	8.2	35.8	28.4
Smith Island, North Carolina	55	9.5	40	30.3
Isle of Palms, South Carolina	53	9	38.3	31.2
Tybee Island, Georgia	53.2	8.3	37.3	28
Tybee Island, Georgia	57.6	9	42	30.5
Pablo Beach, Florida	48	8	35	25.9
Pablo Beach, Florida	55	9	36.9	29
Homestead, Florida	53.4	8.5	37.3	27.7
Big Pine Key, Florida	58.5	8.9	37.4	30.4
Indian Beach, Florida	54.2	9.2	39.5	30
Cedar Keys, Florida	52.5	9	37.7	30

These measurements, which represent the maximum and minimum where series are available, show there is an average increase in size southward from New Jersey to northern and central Florida, the New Jersey individuals being far and away the minimum in the average of the measurements, while the optimum development of the species is apparently reached in the Georgian and north and central Floridian coast regions. There is, however, at each locality represented by a series, sufficient variation in the material to show that measurements of single individuals are of little value, except where they show the actual maximum or minimum of the species at that locality.

Color Notes.—The species exhibits two color phases, green and brown, between which stand certain individuals annectant in their tonal coloration. The green tone ranges from as pale as olive-yellow and as brilliant as clear dull green-yellow to as dull as citron green, while in the brown phase we find the tonal value connected with the greens and ranging as dark as tawny-olive. The dark markings are always more decided in the male and range from dresden brown to mummy brown. The medio-longitudinal stripe of the head and pronotum is always more apparent in the male, rarely as sharply indicated, and never as solid and dark, in the female as in the male, being entirely absent in several of the former sex. It is occasionally limited to the head and also divided longitudinally by a thread of the pale base color. The dark lateral bars are occasionally very weak in strongly green phase females, and never are as strongly marked in the female as in the male. Rarely the pale subcostal tegminal streak is obsolete. Rehn and Hebard[38] already have given notes on the south Florida material here examined.

[38] Proc. Acad. Nat. Sci. Phila., 1914, p. 390, (1914).

Distribution.—In the maritime region from southern New Jersey (as far north as Ocean City), south to the Florida Keys (Long Key, Big Pine Key), and northwestward along the coast of western Florida as far as Cedar Keys. The species has also been reported from the Brownsville region (Caudell) and Eagle Pass (Scudder), Texas, but we know the former is incorrect, really referring to *M. maculipennis maculipennis*, and the latter is in all probability an erroneous association, as extensive field work by Rehn and Hebard in that region, and in the whole stretch of Gulf territory intervening between the Rio Grande and Cedar Keys has failed to bring the species to light.

Biological Notes.—This species is distinctly hygrophilous, found in both fresh and salt marsh situations, occasionally straying into adjacent dune vegetation. Its preference is for coarse high grasses and reeds in open marsh or marshy depressions, occasionally in more strictly bog conditions (Belleplain) or narrow wet drains (Pablo Beach), while it has been taken in dry areas of low oak, bayberry, palmetto and briars among dunes near extensive salt marsh areas (Isle of Palms), and also in bayberry tangles on sand dunes in New Jersey (Cape May). Morse[39] has well said: "It is a shy and active species, flying freely and far, and on alighting dodges quickly around the grass stems to escape observation, or slipping nimbly downward and backward, seeks to hide itself."

Adults of this species have been taken as early as July 6 (Big Pine Keys, Florida) and as late as November 15 (Punta Gorda, Florida), while immature specimens have been taken as early as March 13 (Long Key, Florida) and as late as September 19 to 20 (Big Pine Key). From the northern portion of the range of the species we have no data on captures of adults earlier than August 9 (Ocean City, Virginia), and from New Jersey, August 18 to 22 is the earliest period, while September 24 is our latest date for the same region (Cape May Point). These northern records probably do not represent actual extremes either way, certainly not for last captures, but they are sufficient to show a season for adults some months longer in Florida than at the northern extremity of the range. Adults taken July 6 at Big Pine Key, Florida, were secured with immature individuals in the three instars preceding maturity. From the fact that Davis secured immature material at the same place September 19 to 20, with adults, it

[39] Publ. No. 18, Carneg. Inst., p. 29, (1904).

would seem very probable that the species has more than a single breed at the southern point of its distribution.

Remarks.—This species has no synonymy, but it has been misidentified on several occasions, chiefly on account of the uncertainty attached to the name *bivittata*, and the efforts of authors to follow Scudder's differential features for the species of the genus. Smith reported it as *bivittata*,[40] and again as *vigilans*,[41] in the latter determination following Rehn and Hebard, who had referred Floridian material of the present species to *vigilans*.[42] By the proper reference of the latter to the synonymy under *alacris*, and a corrected conception of *bivittata*, we are able to clear up the uncertainty surrounding these names. In the Scudder Collection we find one male and two females bearing the same data as the type material of *intertexta*, and arranged under *bivittata*, which are clearly *intertexta*. From this material we have evidence of the extent to which Scudder's failure to recognize individual variation in this genus led him into serious difficulties. By dogmatically assuming the exact degree of fastigial angulation to be a specific criterion, he associated very different forms and disassociated material of the same species.

Specimens examined: Previously unreported, 91; 33 ♂, 43 ♀, 1 immature ♂, 14 immature ♀. Previously reported material listed solely as localities.

New Jersey: Belleplain;[43] Anglesea;[44] Cape May;[44] Cape May, Cape County, VIII, 18–31, 1917, (Witmer Stone; near salt marsh and in bayberry thickets on sand dunes), 28 ♂, 40 ♀, 1 immature ♂, 13 immature ♀, [A. N. S. P.].

Virginia: Millenbeck, Lancaster County, VIII, 8, 1915, (H. Fox), 3 ♂, 2 ♀, 1 immature ♀, [Hebard Cln.].

North Carolina: Wrightsville,[45] Smith's Island.[45]

South Carolina: Coast;[45] Isle of Palms.[45]

Georgia: No exact locality;[46] Tybee Island.[45]

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[40] Ins. New Jersey, p. 154, (1900).

[41] Ann. Rep. N. J. State Mus., 1909, p. 179, (1910).

[42] Proc. Acad. Nat. Sci. Phila., 1907, p. 286, (1907).

[43] Recorded as *vigilans* by Fox (Proc. Acad. Nat. Sci. Phila., 1914, p. 487, (1914)).

[44] Reported by Smith as *bivittata* (Ins. N. J., p. 154, (1900)) and *vigilans* (Ann. Rep. N. J. State Mus., 1909, p. 179, (1910)).

[45] Reported by Rehn and Hebard (Proc. Acad. Nat. Sci. Phila., 1916, p. 157, (1916)).

[46] Portion of original material of Scudder.

Florida: Atlantic Beach;[45] Pablo Beach;[47] Jacksonville;[45] South Jacksonville;[45] Cedar Keys;[47] Indian Beach, Sand Key, Pinellas County, IX, 17, 1917, (R. & H.; in area of high grass on landward border of salt marsh), 2 ♂, 1 ♀; Long Boat Key,[45] Useppa Island;[48] Miami;[49] Homestead;[50] Long Key;[50] Big Pine Key.[50]

Mermiria bivittata (Serville).[51] Plate VI, figs. 15-24.

1839. *Opsomala bivittata* Serville, Hist. Nat. Ins., Orth., p. 589. [♀: North America.]
1877. *M[ermiria] bivittata* Scudder, Proc. Bost. Soc. Nat. Hist., xix, p. 30. [Georgia.]
1897. *Mermiria bivittata* McNeill, Proc. Davenp. Acad. Nat. Sci., vi, pp. 204, 205. (In part.)
1899. *Mermiria bivittata* Scudder, Proc. Amer. Acad. Arts and Sci., xxxv, pp. 41, 42. (In part.) ["Georgia" and "Texas" records only.]
1904. *Mermiria bivittata* Morse, Publ. 18, Carneg. Inst. Wash., p. 29. [♂: Fort Barrancas, Florida.]
1907. *Mermiria bivittata* Morse, Publ. 68, Carneg. Inst. Wash., p. 28. (In part.) [♂, ♀: Cheaha [Chehawhaw] Mountain, Alabama; Nugent, Mississippi; Caddo, South McAlester and Wilburton, Indian Territory (now part of Oklahoma); Cache and Mountain Park, (in part), Oklahoma; Denison, St. Jo and Wichita Falls, (in part), Texas, records.]
1907. *Mermiria intertexta* Rehn and Hebard (not of Scudder), Proc. Acad. Nat. Sci. Phila., 1907, p. 286. [♂: Pablo Beach, Florida.]
1916. *Mermiria bivittata* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1916, p. 157. [♀: Billy's Island, Georgia.]

Comparison.—This species is closely related in general appearance to *maculipennis*, and the two are often very hard to separate, particularly in the female sex. The most conspicuous feature of the species is found only in the male sex and is purely a color character, i. e., the absence of a pale subcostal stripe on the tegmina. In all the other species of the genus this is constantly indicated, although rarely subobsolete in males of *intertexta*, which, however, are quite distinct in other features. The other features of difference in this species from *maculipennis* are: the usual presence of a short, weak, cephalic median carina on the fastigium; the proportionately shorter dorsum of the fastigium in both sexes,

[47] Reported by Rehn and Hebard as *vigilans* (Proc. Acad. Nat. Sci. Phila., 1907, p. 286, (1907)). The material there reported by them as *vigilans* since has been correctly assigned to *bivittata*.

[48] Reported by Hebard (Ent. News, xxvii, p. 17, (1916)).

[49] Reported as *Mermiria* species by Rehn and Hebard (Proc. Acad. Nat. Sci. Phila., 1912, p. 250, (1912)).

[50] Reported by Rehn and Hebard (Proc. Acad. Nat. Sci. Phila., 1914, p. 390, (1914)).

[51] The following references may relate to this species, but their assignment cannot be made positively.

1870. *Opomala bivittata* Walker, Catal. Derm. Salt. Brit. Mus., iii, p. 507. [St. John's Bluff, Florida.] (May refer as well to *M. intertexta* or *alacris*.)
1871. *Opomala bivittata* Scudder, Rep. U. S. Geol. Surv. Nebr., p. 250. [Nebraska City, Nebraska.] (May refer as well to *M. maculipennis*.)
1872. *Opomala bivittata* Glover, Ill. N. A. Ent., Orth., pl. vi, figs. 24, 26, pl. xi, fig. 7.

and the fastigio-facial angle also more broadly rounded; the caudal margin of the pronotal disk being more distinctly angulate and the coloration with a larger percentage of green or greenish.

Type.—The original specimen of this species, on which Serville founded the name, was a female from "l'Amerique septentrionale," labelled by Latreille, from whose collection it was received. The description is sufficient to enable us to locate the species with fair certainty and correlated information assists further. Material in Serville's possession, similarly labelled and of similar origin, formed the basis of, among other species, *Leptysma marginicollis*,[52] *Paroxya clavuliger* and *Psinidia fenestralis*. As the range of these species has been fairly well mapped, and, as the region inhabited by *maculipennis* was largely unexplored, or at most unsettled, in the days of Latreille, we can feel relatively safe in considering the probable origin of the Latreille specimen as the southeastern states, where all the other species from the Latreille Collection occur, where *bivittata* as we understand it also occurs, and *maculipennis* is unknown. The present location of the Serville material is not definitely known to us.[53]

Morphological Notes.—The present species shows a relatively small degree of variation in the dorsal fastigial form, viewed from the standpoint of the genus, although there is quite an appreciable difference between the extremes found in either sex. In the male the extremes measure from about 52° to 84° in their angulation, or from a moderately acute angle to nearly a right angle, with its horizontal apex from narrowly rounded to rather broadly and bluntly rounded. The strength of the very short median carina on the cephalic section of the male fastigium varies greatly; it is never really strongly marked and is occasionally absent. The exact width of the marginal rim of the fastigium, due to the position of the intermarginal depression, varies as much in this as in the other species of the genus. In the female the angle of the horizontal apex of the fastigium varies from about 80° to 95°, or from a slightly acute to a slightly obtuse angle, with much variation in the degree and extent of the rounding of the same.

[52] These are placed in their modern genera.

[53] When comparing the description with *intertexta*, the only other species of the southeastern states to which it might apply, it is evident Serville did not have that species, as he says the postocular bars are black, while in *intertexta* they are always brown in the female, and the subcostal pale tegminal bar is so reduced and relatively weak it would not answer the description. In addition, the size of females of *intertexta* from the southeastern states is always greater than "20 lignes," as described.

The indication of the median fastigial carina in the female is as frequent as in the male, but it is generally, when present, less decided than in the other sex. When seen from the lateral aspect the fastigio-facial angle is always well rounded in the female, and rather narrowly, but still appreciably, rounded in the male. This is, in fact, one of the chief distinguishing features of the species. There is quite a little variation in the basal form of the eye, this ranging from ovoid-elliptical to narrowly elongate ovoid. The pronotum shows some little variation in the relative proportions of the dorsum of the prozona and metazona. The caudal margin of the disk of the pronotum is always angulate, broadly obtuse, varying slightly in its degree. The relative breadth to length of the pronotum shows a negligible amount of variation.

We have made a count of the caudal tibial spines of ten males and seven females, comprising the series from Navasota, Texas, with the following results:

♂

Extremes in numbers on external margin	18–22
Extremes in numbers on internal margin	15–18
Average number on external margin	20
Average number on internal margin	16+
Greatest difference between numbers on same margin in same specimens (external)	18–21
Greatest difference between numbers on same margin in same specimens (internal)	16–17

♀

Extremes in numbers on external margin	19–22
Extremes in numbers on internal margin	17–19
Average number of external margin	21
Average number on internal margin	17+
Greatest difference between numbers on same margin in same specimens (external)	19–22
Greatest difference between numbers on same margin in same specimens (internal)	17–18

Synonymy.—The species *bivittata* in the past has never been properly distinguished from *maculipennis*, and the published references to Serville's species are either erroneous (referring to *maculipennis* alone), in part correct (where the forms were not recognized as distinct), or fortuitously correct (where material of this species alone was in hand). The reference of a Pablo Beach male of this species to *intertexta* by Rehn and Hebard, in 1907, was due to the first recognition by those authors of a species distinct from true *intertexta* (then called by them *vigilans*). At that time Rehn and Hebard continued to use the name *bivittata* for the campestral species here shown to be properly called *maculipennis*.

Measurements (in millimeters).

♂	Length of body.	Length of pronotum.	Length of tegmen.	Length of caudal femur.
Lane, South Carolina	29	4.9	20.5	17.4
Lane, South Carolina	30.3	5.2	23.5	18.5
Billy's Island, Georgia	33.5	5.4	23.8	18.4
Pablo Beach, Florida	34.3	5.7	25.2	19.6
Fort Barrancas, Florida	30.7	5.4	24.4	17.6
Chehawhaw Mountain, Alabama	30	5	23.3	18
Nugent, Mississippi	30	5.1	21.6	17.3
Keokuk, Iowa	29.5	5.2	23	18.7
Keokuk, Iowa	30.8	5	21.5	18.2
West Point, Nebraska	28.3	4.6	21	17
Douglas County, Kansas	31[54]	5	23.4	18
Douglas County, Kansas	30.7	4.8	20.4	16.8
Barber County, Kansas	33.7	5.4	25	19.5
Barber County, Kansas	34.8	6	24.3	20.9
Mountain Park, Oklahoma	32	5.2	24	19.8
Caddo, Oklahoma	36	6	26.3	21
Denison, Texas	34	5.4	25.4	20.8
Denison, Texas	36	5.7	26.6	21.4
Dallas, Texas	33.8	5.3	22.8	18.7
Dallas, Texas	34.3	6	25.5	21
Shovel Mountain, Texas	30.8	5.2	24.2	19.8
Shovel Mountain, Texas	32.3	5.8	25	20.3
Navasota, Texas	35	5.5	26	20.2
Navasota, Texas	35.5	6	27.5	21
Flatonia, Texas	31.8	5	23.8	19.5
Flatonia, Texas	37	6	26.2	22
Rosenberg, Texas	33.3	5.6	25	20.2
Rosenberg, Texas	34.7	6	27.3	20.4
♀				
Lane, South Carolina	44.2	7.3	32	25
Lane, South Carolina	47.2	7.8	34	25.7
"Georgia"	43	7.3	32.3	26.7
"Georgia"	46	8	35	27.4
Chehawhaw Mountain, Alabama	44	6.9	34.5	25
Richmond, Kansas	43	7.6	31.8	26.3
Cache, Oklahoma	47	7.7	34.7	27.5
South McAlester, Oklahoma	47.5	7.7	36.7	29
Wichita Falls, Texas	47.3	7.5	34	28
Wichita Falls, Texas	51.3	8	35	30
Denison, Texas	48.3	8	34	28
Denison, Texas	49	8	35.3	28
Dallas, Texas	47	7	33.5	26.7
Shovel Mountain, Texas	39.5	7	29.7	25.4
Shovel Mountain, Texas	45.9	7.5	35.7	27.1
Navasota, Texas	48.8	7.9	34.4	28.6
Navasota, Texas	51.2	8.4	35.8	30.3
Flatonia, Texas	45.8	7.7	32.4	26.7
Flatonia, Texas	48.6	8	34	29
Rosenberg, Texas	49.6	8	34	27.2
Rosenberg, Texas	53.4	8.4	37	29

From these measurements it is evident that the species reaches its maximum of size in southeastern Texas and in the Red River region of northeastern Texas and southeastern Oklahoma, the

[54] Apex of abdomen abnormally extended.

size decreasing as one passes into higher country and northward toward the northern limit of its distribution. The material from West Point, Nebraska, northeastern Kansas and southeastern Iowa is very small, while that from elevated localities in Alabama, Oklahoma and Texas (i. e., Chehawhaw Mountain, Mountain Park and Shovel Mountain) is relatively small. Regarding the size variation in material from the eastern coast we can say but little, as the most northern material known from that region (Havelock, North Carolina) is not now available, and we possess a fair series from but a single definite locality—Lane, South Carolina. The latter shows equally small size when compared with material from the more northern points in the Mississippi Valley and interior region.

Color Notes.—The present species shares with *M. texana* the distinction of having a more fixed color pattern than the other species of the genus. The one striking feature of color difference is a sexual one and it is, as far as the material before us goes, absolutely constant. In the female sex the subcostal stripe is strongly indicated and relatively broad, while in the male it is entirely absent, the species being unique in this respect. The postocular bars are pronounced in both sexes, in the female almost never, and in the male usually, encroaching on the dorsum of the metazona; never, however, to the extent frequently found in *maculipennis*, and then generally in a dilute intensity. Very rarely is a medio-longitudinal bar present on the dorsum of the head and pronotum, and then it is generally limited to the head, made up of separate points and divided in two by a hair line of the general color. In certain specimens of the series in hand the medio-longitudinal line is indicated on the pronotum as well as on the head, and in those cases it is formed by an infuscation of the median carina. Rarely (three males: "Georgia," Chehawhaw Mountain, Alabama; three females; Lane, South Carolina) the median carina of the pronotum is distinctly hair-lined with fuscous, while the head has almost no indication of a line. Invariably the anal area of the tegmina, suturad of the last axillary vein, is of the pale dorsal color.

The pale base coloration of the male ranges from citron yellow (on the abdomen mustard yellow), through yellowish citrine to oil green, with a few specimens (all from Texas) ochraceous-buff to buckthorn brown. The majority of the Texan males are reed yellow. The pale base coloration of the female ranges from citron

green, through sea-foam green and antimony yellow and ochraceous-buff to pale tawny and even (very rarely) hays russet, the dorsum rarely with a ferruginous wash. The postocular bars in both sexes range from deep blackish fuscous to prout's brown, usually, but not invariably, more contrasted in the male than in the female. The dark area of the tegmina of the male ranges from weak cinnamon-brown proximad, paling distad to very weak snuff brown, to solidly blackish fuscous, as a broad, uniform continuation of the postocular bars. In the female, as in the male, the tegminal coloration is controlled by the depth of coloration of the postocular bars, and in this sex they are invariably of the same tone, regularly weakening distad, much the darkest along the proximal section of the costal margin and along the humeral trunk, thus contrasting the enclosed pale subcostal bar. Rarely, in the female sex, a maculate tendency, such as found in *maculipennis*, occurs[55] in variable intensity and extent. An infuscation of the face occurs more or less distinctly in numerous specimens, but it is strongly contrasted and very striking in eastern males alone. The caudal femora range in coloration from brazil red, through scarlet and carnelian red to hazel.

The geographic correlation of coloration seems best summarized by stating that intensive coloration in its maximum development, i. e. very dark postocular bars, medio-longitudinal bar, very dark tegmina and infuscate face, is developed only in the southeastern states, with Kansas specimens closely approaching it, while Texan material chiefly represents the recessive type and stages approach that extreme, with a factor for maculation, such as found in *maculipennis*, becoming evident in that region. The Texan series is sufficiently extensive to show that local conditions are strong influencing coloration factors, while at the same time individual variation, chiefly in the female sex, is considerable in series as extensive as those from Flatonia, Rosenberg and Navasota.

The hays russet tone of general coloration is found in a single female from Lane, South Carolina.

Distribution.—The range of this species extends from eastern North Carolina (Havelock) and the higher country of northern Alabama (Chehawhaw Mountain), to eastern Georgia (Billy's Island) and northern Florida (Pablo Beach), westward along the Gulf Coast probably continuously to Texas; westward in which

[55] Wichita Falls, Tex. (1); St. Jo, Tex. (1); Shovel Mountain, Tex. (7); Flatonia, Tex. (2).

state it is distributed to the region of the Edwards Plateau (Shovel Mountain), extending south in the same state as far as Flatonia and Rosenberg, while northward the range extends to northeastern Nebraska (West Point) and southeastern Iowa (Keokuk). In the southeastern states we do not know its interior limits, as the few exact localities known are practically coastal, with the exception of Chehawhaw Mountain, northern Alabama, while from between the east coast and Texas we have but two reliable records—Fort Barrancas, Florida, and Nugent, Mississippi. In Oklahoma it extends as far westward as the western base of the Wichita Mountains (Mountain Park), and in Kansas its westward known limit is Sun City, Barber County. The only information we have regarding the occurrence of the species in the central Mississippi Valley is its capture at Keokuk, Iowa, from which evidence its presence in southern Illinois would not be surprising.

The species' occurrence within its range is now known to be governed by the presence of rich grasslands and it does not occur as far west or as high as the Great Plains region, being entirely one of the humid district. Its range in part overlaps that of *maculipennis maculipennis* in eastern Texas, Oklahoma, Kansas, Nebraska and Iowa, but, as *maculipennis* is essentially an arid land type, over most of their respective territories the other species does not occur. Zonally *bivittata* is almost entirely Austroriparian and Sabalian, occuring in the Carolinian zone only in the northwestern portion of its territory.

In vertical distribution this species ranges from sea-level (Pablo Beach and Fort Barrancas, Florida) to at least two thousand feet elevation (Chehawhaw Mountain, Alabama, 2000 to 2400 feet; St. Jo, Texas, 1140 feet; Shovel Mountain, Texas, over 1000 feet; Cache, Oklahoma, 1275 feet; Mountain Park, Oklahoma, 1360 to 1690 feet). In Texas the lowest point represented (Harrisburg) is but a few feet above sea-level.

Biological Notes.—All the available information shows *bivittata* to be a species frequenting areas of rich, high grass, with or without intermingled weeds, where it is at times locally very abundant, and in from distinctly maritime (Fort Barrancas and Pablo Beach, Florida) to relatively hilly or at least rolling (Mountain Park, and Cache, Oklahoma; Dallas and Shovel Mountain, Texas) environments. At Fort Barrancas it occurred in *Juncus* along a tidal inlet, at Navasota and Flatonia its preferred habitat was in or near post-oak groves or forest; at Harrisburg the grassy cover was in

open short-leaf pine woods, at Rosenberg in open park-like country with scattered huisache trees (*Vachellia farnesiana*), and at Lane it occured in high grasses in long-leaf pine woods, where the species was locally abundant.

The earliest date we have for adults of the species is June 30 (Shovel Mountain), from which locality we have a fairly regular series of dates until September 18. By far the greater proportion of our dates are in August. One male from Keokuk, Iowa, was taken as late as October first. We have no nymphal material of the species, having secured adults only in our collecting. The species is the earliest maturing form in the eastern states, apparently having past its seasonal greatest abundance before August.

Remarks.—In the past this species has been universally confused with *maculipennis*, or at least with certain phases of that species, and its present recognition is largely due to the fact that the chromosome differences of the two species were recognized by Dr. C. E. McClung, who called our attention to the two forms. The external morphological differences separating them may seem trivial, particularly in view of the known variability of coloration and fastigial features in this genus, but the more one analyses these diagnostic features the more evident becomes their taxonomic importance in the present instance. The fastigium is broader, shorter and blunter than in *maculipennis*, and from the side more strongly rounded, while the median carina of the dorsum of the same is also well indicated in the male. The pronotal disk is of a different shape, with its caudal margin more angulate and less rounded. The absence of the subcostal stripe in the male is invariable in the large series now before us, and in addition the species generally has a more decided and richer green and a clearer, more transparent red brown in its coloration than the other species.

We feel no uncertainty relative to the determination of the species.

Specimens examined:[56] 225, 144 ♂, 81 ♀.

North Carolina: Havelock.

South Carolina: Lane, Williamsburg County; VII, 20, 1917; (M. Hebard; locally abundant in high grasses in long-leaf pine woods); 33 ♂, 13 ♀; [Hebard Cln.].

Georgia: (H. K. Morrison) 6 ♂, 3 ♀; [M. C. Z. and U. S. N. M.].[57] Billy's Island.

[56] Localities previously recorded by the author or Rehn and Hebard are listed without comment.

[57] Portion of material reported by Scudder.

Florida: Fort Barrancas, Escambia County; VIII, 3, 1903; (A. P. Morse); 1 ♂; [Morse Cln.].[58] Pablo Beach.

Alabama: Chehawhaw Mountain, Talladega County, elevation 2000 to 2400 feet; VII, 13, 1905; (A. P. Morse); 1 ♂, 1 ♀; [Morse Cln.].[59]

Mississippi: Nugent, Harrison County; VII, 20, 1905; 1 ♂; [Morse Cln.].[59]

Iowa: Keokuk, Lee County; IX, 19, 1913 and X, 1, 1915; (M. P. Somes); 2 ♂, [Somes Cln.].

Nebraska: West Point, Cuming County; IX; 1 ♂; [Hebard Cln. ex Bruner].

Kansas: Douglas County, 900 elevation; (C. E. McClung); 2 ♂; [McClung Cln.]. Richmond, Franklin County; 1910; (Taylor); 5 ♂, 1 ♀; [McClung Cln.]. Kingman, Kingman County; 1911; (Carothers); 1 ♂; [McClung Cln.]. Barber County; (F. W. Cragin); 2 ♂; [Hebard Cln. ex Bruner]. Independence, Montgomery County; VIII and IX, 1907; (A. Birchfield); 3 ♀; [U. S. N. M.].

Oklahoma: Mountain Park, Tillman County; VIII, 22, 1905; (A. P. Morse); 1 ♂; [Morse Cln.].[59] Cache, Comanche County; VIII, 23, 1905; (A. P. Morse); 1 ♀; [Morse Cln.].[59] Perkins, Payne County; VIII, 13 and 16, 1901; (Mrs. Nellie Caudell and Vivian Cundiff); 4 ♂, 1 ♀; [U. S. N. M.].[60] South McAlester, Pittsburg County; VIII, 7, 1905; (A. P. Morse) 1 ♀; [Morse Cln.].[59] Wilburton, Latimer County; VIII, 27, 1905; (A. P. Morse); 1 ♂; [Morse Cln.].[59] Caddo, Bryan County; VIII, 8, 1905; (A. P. Morse); 1 ♂; [Morse Cln.].

Texas: (Belfrage); 3 ♂; [M. C. Z. and U. S. N. M.]. Wichita Falls, Wichita County; VIII, 16, 1905; (A. P. Morse); 2 ♀; [Morse Cln.].[59] St. Jo, Montague County; VIII, 14, 1905; (A. P. Morse); 1 ♀; [Morse Cln.].[59] Denison, Grayson County; VIII, 12, 1905; (A. P. Morse); 2 ♂, 4 ♀; [Morse Cln.].[59] Handley, Tarrant County; VIII, 3, 1905; (J. C. Crawford); 1 ♂, 1 ♀; [U. S. N. M.]. Dallas, Dallas County; (Boll); 3 ♂; [M. C. Z. and U. S. N. M.]: VIII, 14 to 16, 1915; (R.; in grassland); 1 ♂, 1 ♀. Shovel Mountain, Burnet County; VI, 30, VIII, 4 and 5, IX, 4 to 18, 1901; (F. G. Schaupp); 3 ♂, 10 ♀; [A. N. S. P.]. Hearne, Robertson County; VIII, 14 and 15, 1915; (H.; in high grass); 2 ♂. Navasota, Grimes County; VIII, 14, 1915; (H.; common in high grassy areas among post oaks); 10 ♂, 7 ♀. Flatonia, Fayette County; VIII, 19 and 20, 1912; (R. & H.; very abundant in tall bunch grass with few weeds, near post oak forest); 30 ♂, 21 ♀. Columbus, Colorado County; 1 ♂; [U. S. N. M.]. Rosenberg, Fort Bend County; VII, 25 and 26, 1912; (H.; locally very abundant in heavy weedy and grassy cover in park-like country); 25 ♂,

[58] Reported by Morse (see references above).

[59] Reported by Morse (see references above).

[60] Recorded by Caudell (Trans. Amer. Entom. Soc., xxviii, p. 84, 1902).

10 ♀. Harrisburg, Harris County; VIII, 13, 1915; (H.; in grassy area in open short-leaf pine woods); 1 ♂.

Mermiria maculipennis maculipennis Bruner. Plate VI, figs. 25 and 26; Plate VII, figs. 1-6, 8-14.

1890. *Mermiria maculipennis* Bruner, Proc. U. S. Nat. Mus., xii, p. 54. [♂, ♀: San Antonio and Carrizo Springs, Texas.]
1893. *Mermiria bivittata* Townsend (not *Opsomala bivittata* Serville, 1839), Insect Life, vi, p. 31. [Sabinal, New Mexico; Las Cruces, New Mexico.]
1897. *Mermiria bivittata* McNeill, Proc. Davenp. Acad. Nat. Sci., vi, pp. 204 and 205. (In part.)
1897. *Mermiria maculipennis* McNeill, Ibid., pp. 204 and 206. [San Antonio and Carrizo Springs, Texas; Risville (err. pro Rioville), Nevada.]
1899. *Mermiria bivittata* Scudder, Proc. Amer. Acad. Arts and Sci., xxxv, pp. 41 and 42. (In part.) [Records from Texas, Arizona, New Mexico and probably Kansas apply to this form.]
1902. *Mermiria bivittata* Scudder and Cockerell (not *Opsomala bivittata* Serville, 1839), Proc. Davenp. Acad. Sci., ix, p. 24. [Sabinal, Las Cruces and Mesilla, New Mexico.]
1904. *Mermiria maculipennis* Bruner, Biol. Cent.-Amer., Orth., ii, p. 39, pl. i, fig. 9. [Carrizo Springs and San Antonio, Texas.]
1904. *Mermiria bivittata* Bruner (not *Opsomala bivittata* Serville, 1839), Ibid., p. 39. [Las Cruces and Mesilla, New Mexico; Arizona; New Mexico and Texas.]
1906. *Mermiria bivittata* Snow (not *Opsomala bivittata* Serville, 1839), Trans. Kansas Acad. Sci., xx, p. 36. [San Bernardino Ranch, Arizona.]
1907. *Mermiria bivittata* Morse, Publ. 68, Carneg. Inst. Wash., p. 28. (In part.) [The following records apply to this form: Amarillo, Bonita, Clarendon, Quanah and (part) Wichita Falls, Texas; Mountain Park (in part) and base of Mount Sheridan, Oklahoma.]

Comparison.—We have given under *M. bivittata* the leading features of difference between the two species, while under *M. maculipennis macclungi* we have discussed the features differentiating the latter race from the typical form of the species.

Type.—♀; San Antonio, Texas. June. (M. Newell.) [Hebard Collection ex Bruner, Type no. 20.]

The species was originally based on an unnumbered series of both sexes from two localities. Rehn and Hebard have already selected[61] the above listed specimen as the lectotype.

The type is of average size for the general region in which it was taken, and its color pattern is much like that seen in individuals in our series from Benevides and Beeville, Texas, but the tone of the pale color is very light and, in a measure at least, due to liquid immersion.

Allotype.—♂; Carrizo Springs, Dimmit County, Texas. June, [1885]. (A Wadgymar.) [Hebard Collection ex Bruner.]

Morphological Notes.—In general form the present race exhibits as a whole a more elongate and relatively slender body, when

[61] Proc. Acad. Nat. Sci. Phila., 1912, p. 62, (1912).

compared with *M. m. macclungi*, but much variation, often of a confusing character, is found in the large series before us. Progressive elongation and slenderness is evident in material from south-central, south to southern Texas, and in the Trans-Pecos region of the same state, particularly emphasized in specimens from the intermontane section of the Rio Grande valley, to at least as far north as Albuquerque, from the northward of which point we have no New Mexico material. From southern Arizona, on the other hand, we find the material unusually robust, in this respect paralleled by *M. neo-mexicana*, which has identical tendencies in the same region.

The variation in general form of the fastigium and of the fastigio-facial angle is parallel to that found in other species of the genus, showing similar variation in single locality series in both sexes, but, as usual, more pronounced in the male than in the female. The extremes of both sexes in three representative fair-sized series show fastigial (horizontal) angles as follows: ♂; Benevides, Texas, 63°, 72°; Dallas, Texas, 62°, 84°; Albuquerque, New Mexico, 72°, 75°; ♀; Benevides, Texas, 73°, 80°; Dallas, Texas, 82°, 88°; Albuquerque, New Mexico, 65°, 82°.

Non-typical material from northern Texas and Oklahoma shows a distinct shortening and relative broadening of the pronotum, particularly the disk, when compared with central and south Texas individuals. In typical material the caudal margin of the pronotal disk is more broadly and weakly angulate than in the non-typical material, which averages with more distinct and produced angulation. The more apparent median constriction of the disk of the pronotum, when compared with typical *M. m. macclungi*, is a feature almost invariably characteristic of *M. m. maculipennis*, while in non-typical northern Texas and Oklahoma material, particularly of the female sex, the tendency is but faintly or not at all indicated.

The caudal femora show to an extreme degree the variation in robustness frequent in the genus, and occasionally the disparity in proportion of length to breadth is very marked.

Synonymy.—Fortunately the species, and more particularly this form, has managed to escape synonyms, which is particularly remarkable when its great variability is known, and when the fact that it was first described from a strongly variant and non-diagnostic color phase is considered. The general practice has been either to use the name *bivittata* for the northern race here called

macclungi, and use *maculipennis* as a distinct name for the southern type, or to consider all inseparable under the name *bivittata*. That the latter name, as used by McNeill and Scudder, covered representatives of three forms is evident to the present day student. Caudell once recorded the species from the Brownsville region of Texas as *intertexta*.[62]

Measurements (in millimeters).

♂	Length of body.	Length of pronotum.	Length of tegmen.	Length of caudal femur.
Katherine, Texas	32.8	5.4	25.4	20.8
Katherine, Texas	38.5	6	28	24
Benevides, Texas	29.8	4.9	22.5	18.6
Benevides, Texas	35.5	5.5	26.6	22.4
Gregory, Texas	36.4	5.6	26	22
Gregory, Texas	41.5	6.5	29.4	25.2
Beeville, Texas	35.8	5.5	27.2	21.5
Beeville, Texas	36	5.9	26.8	22.5
Hearne, Texas	32	5	24	19.4
Hearne, Texas	34.3	5.5	25	21.8
Carrizo Springs, Texas, *allotype*	35.5	6	27	21.7
Marathon, Texas	30	4.7	21.2	18
Marathon, Texas	32.8	5.4	—	20
El Paso, Texas	27.2	4	19.8	17.2
El Paso, Texas	32.5	5.5	24.2	21.5
Albuquerque, New Mexico	24.5	4.2	—	15.4
Albuquerque, New Mexico	29.4	4.9	23	18.2
Douglas, Arizona	33	5.4	25	19.7
Palo Alto Ranch, Arizona	31.2	5.6	24.5	19.8
Rioville, Nevada	39.4	6.3	29.7	23.5
Atypical				
Dallas, Texas	30.5	4.8	23	18.7
Dallas, Texas	38	6.5	28	23.5
Base of Mt. Sheridan, Oklahoma	33.4	5.4	24.8	19.8
Base of Mt. Sheridan, Oklahoma	34.2	5.5		21
♀				
Katherine, Texas	51.2	7.7	33.4	28.8
Katherine, Texas	54	8.2	35.4	29.8
Benevides, Texas	46.8	7.5	34.7	28.4
Benevides, Texas	51.5	8.2	36.6	31.2
Corpus Christi, Texas	44	7.6	33.8	27.6
Corpus Christi, Texas	49.6	7.8	35	30.3
Beeville, Texas	50	8	37.3	30
Beeville, Texas	55.5	8.9	38.2	30.6
Hearne, Texas	43.9	7	31.5	26.5
Hearne, Texas	47	7.2	34	27.5
San Antonio, Texas, *type*	47.6	8	36.4	29.3
Marathon, Texas	43	6.5	30.6	24.5
Marathon, Texas	48.4	7.4	34	28.4
El Paso, Texas	40.8	6.5	32.8	25.6
El Paso, Texas	52.3	8.1	35.5	30.4
Albuquerque, New Mexico	38.4	6.6	30.5	25.3
Albuquerque, New Mexico	43.5	7	33.4	28
Douglas, Arizona	47	7.5	26.7	27
Douglas, Arizona	52	8.7	38	28.9

[62] Brooklyn Inst. Arts and Sci., Sci. Bull., i, p. 110, (1904).

	Length of body.	Length of pronotum.	Length of tegmen.	Length of caudal femur.
Sycamore Wash, Arizona	49.8	7.8	34.5	26.4
Rioville, Nevada	50	8	36	22
Atypical				
Dallas, Texas	41	6.7	28.9	24.7
Dallas, Texas	48.5	8.1	37	30
Mountain Park, Oklahoma	47.5	7.9	34.9	28.5

From the above measurements it is evident there is a very great amount of individual size variation, while at the same time there is a certain amount of geographic correlation of this feature. The maximum sized specimens are from two regions—one, the south-central portion of Texas; the other, the Rio Colorado region of southern Nevada (Rioville). As we have but a single pair from the latter region, this condition may not be supported in a more extensive representation. The species, as well as the race, is, however, distinctly at its maximum size in the mesquite region of south and south-central Texas, west to the vicinity of Carrizo Springs. The minimum sized individuals are from the Rio Grande region of New Mexico and western Texas, these belonging to the markedly attenuate condition found in that region and discussed under "Morphological Notes." The atypical specimens from northern and north-central Texas (Dallas and Hearne) are under the average size for the form.

Color Notes.—The pattern variation in this form covers practically the whole gamut of such fluctuation as found in the genus, the combination of these tendencies or "unit characters" being much the same as in the other species, but the apparent strength of the pattern is very greatly altered by general tonal modifications, which probably are responses to environmental conditions. The relative intensity of the paired cephalic and pronotal postocular bars; the relatively solid coloration or maculate condition of the discoidal field of the tegmina, especially in the female sex; the contrast of the pale subcostal line on the tegmina; the strength, width and continuity of the median dark line on the head and pronotum, and the presence, and intensity and solidity when present, of dark barring on the dorsum of the caudal femora, as well as the depth of the coloration of the caudal tibiæ, are all features which, in a series as large as the present one, show kaleidoscopic variation. Of these there appears to be some geographic correlation in the extent to which the blackish of the postocular bars extends upon the dorsum of the pronotum. In material from central and southern Texas this is usual and more extensive

and pronounced than in that from other regions, while the tendency is infrequent or almost absent in atypical or intermediate (*M. m. maculipennis*×*M. m. macclungi*) individuals. This extension is always narrower on the prozona than on the metazona, and occasionally is very broad on the latter section, leaving the pale coloration as a narrow median line, which may or may not be pencilled with a median dark line. Rarely the blackish on the metazona is pronounced only at its inner margin, and is almost separated from the lateral bars, thus forming additional longitudinal dashes of dark color. Very rarely the postocular bars are subobsolete on the metazona. The width of the actual postocular bars and their solidity are variable entirely independent of the extension of the bars, the former feature in both sexes, the latter in the female alone, the bars being invariably solid in the male sex.

Oblique infra-ocular stripes on the genæ are rarely indicated, never complete or solid. A pale area is generally present in the axillary field of the tegmina, and this is of variable width, occasionally dark along the sutural margin, producing a dark median line on the closed tegmina. The tegmina of the female in typical southern and central Texas material, and north Texas atypical material, is generally maculate to a greater or lesser degree; in material from west of those regions rarely maculate. In the male sex the tegmina are never more than weakly maculate.

One male (base of Mount Sheridan, Oklahoma) has a combination of complete broad dorsal bar and strong lateral bars, which greatly suggests *M. texana*.

In general tonal depth the central and south Texas material is strongly intensive, that from north Texas localities slightly weaker, the west Texas specimens and those from the Mesilla region, New Mexico, paler and more grayish overcast, the Albuquerque series very dull and dark, the few Arizona and Nevada specimens brilliant and clear, with light yellow and green tones.

The general pale color in the male ranges from straw yellow, through barium yellow and amber yellow, light chalcedony yellow, chalcedony yellow to light green-yellow; in the female from light ochraceous-buff, through light ochraceous-salmon, light pinkish cinnamon, dull zinc orange to tawny on one hand; and through ochraceous-buff, barium yellow, mustard yellow to primuline yellow on the other hand. The dark pattern varies from bone brown to blackish brown. The shade of the caudal tibial color

ranges from grenadine red through bittersweet orange to bittersweet pink on one hand, and through light coral red to testaceous on the other hand.

Distribution.—From Navasota and Hearne, east-central Texas, westward to south-central (Altar Valley and Baboquivari Mountains) and central (Fort Whipple) Arizona and southern Nevada (Rioville), and from the Mexican boundary northward typically as far as Hearne, Midland and Amarillo, Texas, and Dimmit Lake and Albuquerque, New Mexico. Material from localities ranging from Dallas, Temple, Ira and Clarendon, Texas, northward over central and western Oklahoma to central Kansas (Clarendon, Belpre and Russell) are atypical or clearly intermediate between *M. m. maculipennis* and *M. m. macclungi.*

The southern race of the species, i. e., typical *maculipennis,* is thus seen hardly to encroach upon the humid section of eastern Texas, while westward its distribution is largely controlled by suitable grasslands, these usually in bolson plains or river valleys.

The vertical distribution of the race is known to extend from approximately sea-level (Corpus Christi and Gregory, Texas) up to at least 5318 feet (Fort Whipple, Arizona). In Texas we know it ranges from the lowest localities here given to approximately 4000 feet (Marathon and Kent). The lowest locality we have for it in Arizona is 3200 feet (Palo Alto Ranch). The Oklahoma localities range between 1360 and 2700 feet above sea-level. The present geographic form, and for that matter the species, reaches sea-level only in the Rio Grande Plain, where, under semi-arid conditions, the species apparently reaches its optimum development.

Biological Notes.—The occurrence of this species as a whole, as throughout the genus, is governed by the distribution of grass patches or continuous grass prairie. The present race is typically one of arid and semi-arid regions and its favorite environment is associated with a number of dominant types of vegetation, as groves of high mesquite and clump *Opuntia* in southern Texas, weedy pastures and prairies in the same region, post oak groves in central Texas, associated with cat-claw (*Acacia*) in west central Texas, and about composites on river plain in the Rio Grande region of western Texas and southern New Mexico. Sun-cured grass is apparently just as attractive to *M. mac. maculipennis* as the more succulent green vegetation.

The period of adult occurrence is slightly more than four months, the earliest date being June 12 (Cotulla, Texas), the latest October 16 (El Paso, Texas). At Marathon, Texas, it occurs adult as early as July 1 and as late as September 2; Rehn and Hebard have reported it from El Paso as early as July 10 and we now have it as late as October 16 from the same locality, while we have from the adjacent Mesilla region of New Mexico material taken June 28 and 30. The span of the species in the adult condition for any one locality can be safely set at about three months. The only immature specimens we have before us were taken July 8 (Spofford and Johnstone, Texas) and August 14 to 16 (Dallas), at the latter locality accompanied by adults.

Remarks.—This race, the typical form of the species, is almost entirely one of the semi-arid and arid grasslands of the southwestern United States, occurring in its extreme development in such situations in the Rio Grande Plain and Fayette Prairie region of Texas, as well as in the bolson plains and river valleys of the southern portions of New Mexico, Arizona and Nevada. Southward and in the Rio Grande region it shows especially pronounced attenuation in form, while Arizona and Nevada material, limited in number though it is, shows a relatively more robust form, retaining, however, the other characteristics of the race. The optimum development of the species is apparently reached in south-central Texas, although the pair from southern Nevada is very large. In northern Texas the material of this race is less typical, the form somewhat shorter proportionately, the head blunter in general form and the pronotum not as elongate, nor the caudal angle of the disk of the same of the typical broadly rounded condition. As material from more northern localities is examined, the divergence from the southern type becomes more pronounced, until in Nebraska and in western Kansas we have typical *mac. macclungi*, which is apparently a more northern Great Plains and Great Basin representative of *maculipennis*, clearly intergrading, as stated above, when material from intervening regions is examined.

In every series of any size of atypical or intermediate material, certain specimens showing instability and, to a greater or lesser degree, the characters of one or the other extreme will be encountered. This is particularly pronounced in the three individuals from Amarillo, Texas, one male of which is essentially typical *m. maculipennis*, while the remaining pair are clearly

atypical. The Clarendon, Texas, male also strongly indicates a tendency toward *macclungi*, in a general region where merely atypical *m. maculipennis* predominates.

From the distributional data available it would seem that, in a general way, true *maculipennis* follows the river valleys northward from the region of its widest occurrence, while the higher ground, the benches and ridges, carry southward tendencies toward the more northern *macclungi*. When typical individuals of the two forms are compared they appear widely separated, but a series such as the present one shows the relationship very clearly.

Specimens examined: 285; 167 ♂, 118 ♀.

Texas: Brownsville region; 1 ♂; [B. I.].[63] Mission, Hidalgo County; VIII, 6, 1912; (H.; in arid section covered with high mesquite and a great variety of *Opuntia*); 1 ♀. Lyford, Cameron County; VIII, 6 and 7, 1912; (R. & H.; few in weedy field with sand spur); 1 ♀. Katherine, Willacy County; VIII, 8, 1912; (R. & H.); 5 ♂, 3 ♀. Gulf Coast of Texas; 1884; (Aaron); 2 ♂, 1 ♀; [M. C. Z. and U. S. N. M.]. Robstown, Nueces County; VIII, 9, 1912; (R. & H.; on plain of low mesquite, *Opuntia* and joint cactus, with dry yellow grass); 2 ♂. Benevides, Duval County; VIII, 9 to 10, 1912; (R. & H.; fairly numerous in cleared pasture overgrown with open stand of woody weeds); 10 ♂, 7 ♀. Corpus Christi, Nueces County; VII, 29, 1912; (H.); 3 ♂, 3 ♀. Gregory, San Patricio County; VII, 30, 1912; (H.; occasional on grassy plain with mesquite); 3 ♂. Beeville, Bee County; VII, 28, 1912; (H.; common in mesquite region with undergrowth solely of dry yellow grass); 12 ♂, 12 ♀. Victoria, Victoria County; VII, 27, 1912; (H.; occasional in field thickly grown up in grasses and other vegetation); 4 ♂, 1 ♀. Flatonia, Fayette County, 475 feet; VIII, 19, 1912; (R. & H.); 2 ♂, 2 ♀. Waelder, Gonzales County; VI, 25, 1897; (A. P. Morse); 1 ♂; [M. C. Z.]. Navasota, Grimes County; VIII, 14, 1915; (H.; in grassy areas among post oaks); 2 ♂. Hearne, Robertson County; VIII, 14 to 15, 1915; (H.; in sparsely grassed area near oak woods); 8 ♂, 3 ♀. Cotulla, Lasalle County; VI, 12, 1908; (E. S. Tucker); 1 ♀; [U. S. N. M.]. San Antonio, Bexar County; VI; (M. Newell); 1 ♀, *type;* [Hebard Collection ex Bruner]. Uvalde, Uvalde County, 1000 to 1100 feet; VIII, 21 to 22, 1912; (R. & H.; scarce on slopes among low *Acacia*); 2 ♂, 2 ♀. Carrizo Springs, Dimmit County; VI, 1885; (A. Wadgymar); 1 ♂, *allotype;* [Hebard Collection ex Bruner]. Del Rio, Valverde County, 900 to 1100 feet; VIII, 22, 1912; (R. & H.); 2 ♂, 2 ♀. Marathon, Brewster County, 3940 to 4160 feet; VIII, 1 to 2, 1916; VIII, 20, 1916; (R.; scarce in moister areas); VIII, 26 to 27 and IX, 2, 1912; (R. & H.; common everywhere on plain where high grass occurred); 9 ♂, 7 ♀. Garden Spring,

[63] Reported by Caudell as *M. intertexta.*

Brewster County; IX, 2, 1912; (R. & H.); 1 ♂. Kent, Culberson County; 3900 to 4200 feet; IX, 17 to 18, 1912; (R. & H.; scarce in tall grasses near water); 2 ♂, 1 ♀. El Paso, El Paso County, 3650 to 3700 feet; IX, 16, 1912 and X, 16, 1910; (R. & H.; fairly abundant in low composites along river plain); 8 ♂, 8 ♀. Midland, Midland County, 2779 feet; (R. & H.; very scarce in prairie area); 1 ♂. Amarillo, Potter County; VIII, 19, 1905; (A. P. Morse); 1 ♂; [Morse Cln.].

New Mexico: Dimmit Lake, near Roswell, Chaves County; (Cockerell); 1 ♂; [U. S. N. M.]. Mesilla, Dona Ana County; VI, 28 and 30, 1897; (A. P. Morse); 3 ♂, 1 ♀; [M. C. Z.]. Mesilla Park, Dona Ana County, 3800 feet; VII, 16 (one specimen); (Cockerell); 2 ♂, 1 ♀; [U. S. N. M. and M. C. Z.]. Las Cruces, Dona Ana County; VIII, 12; 1 ♂; [Hebard Cln.]. Sabinal, Socorro County; VIII, 7; (C. H. T. Townsend); 4 ♂, 1 ♀; [M. C. Z. and U. S. N. M.].

Arizona: Douglas, Cochise County; VIII; (F. H. Snow); 2 ♂, 3 ♀; [U. S. N. M. and A. N. S. P.]. Lower end of Sycamore Wash, Altar Valley, Pima County, about 3400 feet; X, 6 and 9, 1910; (R. & H.; in dry yellow grass); 1 ♀. Palo Alto Ranch, Altar Valley, Pima County, 3200 feet; X, 10, 1910; (R. & H.; in meadow of coarse green bunch grass); 1 ♂. Fort Grant, Graham County; 1882; 1 ♂, 1 ♀; [U. S. N. M.]. Fort Whipple, Yavapai County; (E. Palmer); 1 ♂; [Hebard Cln.].

Nevada: Rioville,[64] Clark County; VIII, 2, 1891; 1 ♂, 1 ♀; [U. S. N. M.].

Atypical

Texas: Ira, Scurry County; VIII, 7, 1901; (E. G. Francis); 1 ♂; [U. S. N. M.]. Amarillo, Potter County; VIII, 19, 1905; (A. P. Morse); 1 ♂, 1 ♀; [Morse Cln.].[65] Quanah, Hardeman County; VIII, 21, 1905; (A. P. Morse); 2 ♂, 1 ♀; [Morse Cln.].[65] Wichita Falls, Wichita County; VIII, 15, 1905; (A. P. Morse); 1 ♂; [Morse Cln.].[65] Byers, Clay County; VII, 1910; (Isely); 1 ♂; [U. S. N. M.]. Bonita, Montague County; VIII, 14, 1905; (A. P. Morse); 1 ♂; [Morse Cln.].[65] Cisco, Eastland County, 1450 to 1550 feet; IX, 21 and 22, 1912; (R. & H.; common in meadow); 9 ♂, 13 ♀.[66] Weatherford, Parker County, 1000 to 1100 feet; IX, 23, 1912; (R. & H.; scarce in high grasses); 1 ♂, 1 ♀. Dallas, Dallas County; VIII, 14 to 16, 1915; (R.; common in grasses in prairie region and in fringe of low oaks and junipers, nymphs also present); 29 ♂, 25 ♀: VII, 16 (two specimens); (Boll); 6 ♂, 3 ♀; [M. C. Z. and U. S. N. M.].[67] Sagamore Hill, Tarrant County, 650 feet; IX, 27, 1912; (R. & H.; grass patches

[64] Erroneously given as Risville by McNeill, on the basis of the same material.

[65] Recorded by Morse (Publ. 68, Carneg. Inst. Wash., p. 28, 1907) as *bivittata*.

[66] A minority of this material is nearly typical, but the majority from this locality is appreciably atypical.

[67] Quite a few of this series are nearly typical of *maculipennis maculipennis*, particularly males, but the majority are atypical, the females almost entirely so.

among skin oaks); 1 ♀. Handley, Tarrant County; VIII, 3, 1905; (J. C. Crawford); 3 ♂; [U. S. N. M.]. Bosque County; IX, 10; (Belfrage); 1 ♂; [M. C. Z.]. Temple, Beal County, 710 feet; IX, 24, 1912; (R. & H.); 2 ♀.

Oklahoma: Mountain Park, Kiowa County; VIII, 22, 1905; (A. P. Morse); 1 ♀; [Morse Cln.].[65] Base of Mount Sheridan, Wichita Mountains, Comanche County; VIII, 24, 1905; (A. P. Morse); 1 ♂; [Morse Cln.].[65]

Intermediate between M. m. maculipennis and M. m. macclungi.

Texas: Clarendon, Donley County; VIII, 18, 1905; (A. P. Morse); 1 ♂; [Morse Cln.].[65]

Oklahoma: Base of Mount Sheridan, Wichita Mountains, Comanche County; VIII, 24, 1905; (A. P. Morse); 1 ♂; [Morse Cln.].[65] Perkins, Payne County, VIII, 13, 1901; (Nellie Caudell); 1 ♀; [U. S. N. M.].

Kansas: Clearwater, Sedgwick County; VIII, 1904; (F. B. Isely); 1 ♀; [U. S. N. M.]. Wichita, Sedgwick County; IX, 19, 1 ♂; [U. S. N. M.]. Belpre, Edwards County; IX, 13, 1909; (H.; in short grass); 1 ♂. Clarendon, Barton County; VII, 26, 1891; 2 ♂; [U. S. N. M.]. Dorrance, Russell County; 1910; (C. E. McClung); 1 ♀; [McClung Cln.]. Russell, Russell County; (C. E. McClung); 3 ♂; [McClung Cln.]. Wellington, Sumner County; VI, 1909; (F. G. Kelly); 1 ♀; [U. S. N. M.]. Barber County; (F. W. Cragin); 1 ♀; [Hebard Cln. ex Bruner]. Hill City, Graham County; 1909; (C. E. McClung); 2 ♂; [McClung Cln.]. Garden City, Finney County, (F. B. Milliken); 1 ♂; [U. S. N. M.].

Mermiria maculipennis macclungi new subspecies.[68] Plate VII, figs. 15-24.

1872. *Opomola bivittata* Dodge (not *Opsomala bivittata* Serville, 1839), Canad. Entom., iv, p. 15. [Between Platte River and Omaha, Nebraska.]
1877. *Opomala bivittata* Bruner (not *Opsomala bivittata* Serville, 1839), Ibid., ix, p. 144. [Nebraska.]
1897. *Mermiria bivittata* McNeill, Proc. Davenp. Acad. Nat. Sci., vi, pp. 204 and 205. (In part.) [State records from Nebraska and probably Illinois apply to this form.]

[68] It is not possible to determine whether the following references relate to true *bivittata* or to *mac. macclungi.*

1865. *Opomala bivittata* Thomas, Trans. Ill. State Agric. Soc., v, p. 447. [Illinois.]
1877. *Opomala bivittata* Bessey, Bienn. Rep. Iowa Agric. Coll., vii, p. 207. [Iowa.]
1880. *Mermiria bivittata* Thomas, Rep. Entom. Ill., ix, pp. 87, 92 and 97. [Illinois.]
1892. *Mermiria bivittatus* Osborn, Proc. Iowa Acad. Sci., i, pt. 2, p. 118. [Iowa.]
1897. *Mermiria bivittata* Ball, Proc. Iowa Acad. Sci., iv, p. 238. [Iowa.]

Isely (Trans. Kansas Acad. Sci., xix, p. 241, (1905)) has recorded *bivittata* from Sedgwick County, Kansas, east of Fairmount and Brown County, Kansas. If these do not refer to true *bivittata*, the first two represent intermediates between *M. m. maculipennis* and *M. m. macclungi*, the last one probably *M. m. macclungi.*

1899. *Mermiria bivittata* Scudder, Proc. Amer. Acad. Arts and Sci., xxxv, pp. 41 and 42. (In part.) [State records from Nebraska, Colorado, Utah and possibly Iowa apply to this form.]
1903. *Mermiria texana* Caudell, Proc. U. S. Nat. Mus., xxvi, p. 780. (In part.) [Material from Fort Collins, Colorado.]
1904. *Mermiria bivittata* Gillette (not *Opsomala bivittata* Serville, 1839), Bull. 94, Colo. Agr. Exp. Sta., p. 23. [Fort Collins, Laporte, Windsor, Greeley, Orchard, Julesburg, Wray, Rockyford and Holly, Colorado.]
1907. *Mermiria bivittata* Hart (not *Opsomala bivittata* Serville, 1839), Bull. Ill. State Labor. Nat. Hist., vii, p. 231. [Havana, Meredosia, Tamaroa and Chatauqua, Illinois.]
1913. *Mermiria bivittata* Vestal (not *Opsomala bivittata* Serville, 1839), Ibid., x, p. 20. [Havana, Illinois.]

This well-marked race can be distinguished in typical material from *M. mac. maculipennis* by the less attenuate and relatively more robust form, the shorter and relatively broader pronotum, which is not appreciably constricted mesad, the caudal angle of the disk of the pronotum being more distinctly produced and angulate, the eyes of the female being less prominent from the dorsum and by the generally smaller size. Under *Mer. mac. maculipennis* we have discussed the relationship and intergradation of the two forms.

Type.—♂; Forsyth, Rosebud County, Montana. July 27, 1909. (Morgan Hebard.) [Hebard Collection, Type No. 445.]

Description of Type.—Form more robust and less attenuate than in *M. mac. maculipennis;* size smaller.[69] Head with fastigiofacial angle less acute, more truncate in lateral aspect, the facial line less strongly declivent. Antennæ proportionately longer, their length equal to at least four-fifths that of the caudal femora. Pronotum distinctly shorter and proportionately broader, the greatest caudal width contained about one and one-half times in the greatest length of the same, narrowing of the dorsum of the prozona less pronounced than in *M. mac. maculipennis;* caudal margin of the disk of the pronotum more distinctly, though very broadly, obtuse-angulate, with the immediate angle less rounded.

Allotype.—♀; same data as type. [Hebard Collection.]

Description of Allotype.—Form and size as in male. Antennæ proportionately longer. Pronotum distinctly shorter, and broader proportionately, the narrowing of the dorsum of the prozona less pronounced than in *M. mac. maculipennis.*

Paratypic Series.—We have before us fourteen males and one female, bearing the same data as the type and allotype, which we

[69] The small individuals of *M. mac. maculipennis* from the Rio Grande region, from El Paso to Albuquerque, are hardly or not at all larger than *M. mac. macclungi,* but they are distinctly more slender in every way.

consider paratypes. These are located in the Hebard Collection and that of the Academy of Natural Sciences of Philadelphia.

Morphological Notes.—As already shown, the present race is a shorter, relatively more robust form than *M. mac. maculipennis.* It shows much less variation in the morphological features mentioned under the typical form of the species than does the latter, while such progressive elongation and slenderness as is there evident is not found in typical *macclungi*, being apparent only in the individuals intermediate in character between *M. mac. maculipennis* and *M. mac. macclungi.* The extremes of both sexes in three representative fair-sized series show variations in the fastigial (horizontal) angle as follows: ♂; Forsyth, Montana, 71.5°, 87°; Fort Collins, Colorado, 68.5°, 76°; North Platte, Nebraska, 77.5°, 87°: ♀; Forsyth, Montana, 84.5° (no variation); Fort Collins, Colorado, 85°, 87°; North Platte, Nebraska, 80.5°, 89.5°.

Synonymy.—The general misidentification of this form as *bivittata* has already been discussed. Caudell's reference of Fort Collins material of this race to *M. texana* was an error in identification, as the material, now before us, shows.

Measurements (in millimeters).

♂	Length of body.	Length of pronotum.	Length of tegmen.	Length of caudal femur.
Forsyth, Montana, *type*	26	4.5	19.7	16.3
Forsyth, Montana, *paratype*	26.2	4.3	18.8	16
Forsyth, Montana, *paratype*	29.3	5	21.6	17.4
Julesburg, Colorado	25.3	4.5	19.6	16
Julesburg, Colorado	27.3	4.3	19.7	15
Fort Collins, Colorado	27.2	4.4	19.2	15.9
Fort Collins, Colorado	30.8	4.8	20.8	16.9
Pueblo, Colorado	29.3	5	21.2	18.1
Pueblo, Colorado	32	4.9	23.6	19
Glen, Nebraska	21	4.2	19.7	15
Glen, Nebraska	27.2	4.5	19.2	16.1
North Platte, Nebraska	25	4.1	18.9	15.8
North Platte, Nebraska	27.4	4.5	19.4	16
West Point, Nebraska	26.1	4.5	19.8	15.6
West Point, Nebraska	28.4	4.9	22	17.8
Salt Lake City, Utah	28	4.6	18.3+	17
Salt Lake Valley, Utah	28.5	4.7	20.5	17.3
♀				
Forsyth, Montana, *allotype*	43.6	6.6	28.5	22.5
Forsyth, Montana, *paratype*	45	6.5	28.5	22.2
Glendive, Montana	41.2	6.5	27.7	21.8
Julesburg, Colorado	37	5.5	27.5	21.2
Fort Collins, Colorado	38.3	6.3	30.8	23.7
Fort Collins, Colorado	40.5	6.5	28.2	22.3
Pueblo, Colorado	40	6.7	31	25.4
Pueblo, Colorado	41	7	32.3	25.2
Glen, Nebraska	36	6.3	27	22.4

	Length of body.	Length of pronotum.	Length of tegmen.	Length of caudal femur.
Glen, Nebraska	41	6.4	29.7	23.2
North Platte, Nebraska	37.8	5.8	26	21
North Platte, Nebraska	42	6.5	30.2	23.9
West Point, Nebraska	38	6.4	27.8	22
West Point, Nebraska	42	6.7	29	23.5
Syracuse, Kansas	48.4	7	32	26
Hollister, Missouri	34	5.5	27	21.2
Muscatine, Iowa	37	6.3	30	23.2
Onawa, Iowa	37.7	6.5	28.5	22.5
Lone Rock, Wisconsin	32.7	5.4	23.8	19.5
Havana, Illinois	39.5	5.5	25.6	22.2
Maple Peak, Utah	43	7	30.5	25.4
Maple Peak, Utah	42.5	6.5	29.2	25
Atypical ♂				
Clarendon, Kansas	29.5	5	20.5	17.4
Clarendon, Kansas	30.3	5.3	24.2	19.5
♀				
Clearwater, Kansas	42.8	7.5	32	25
Barber County, Kansas	43	7.6	34	26.5

From these measurements it is evident that while the maximum sized individuals are from the more southern portion of the range of the race, as would be expected from the average larger size of *Mer. mac. maculipennis*, the smallest specimens are, as might be inferred, from the more northern localities. Unfavorable environment may be responsible for the minimum sized individuals occurring in the sand-hill regions of Nebraska and Illinois, and the high plains region of northeastern Colorado, but peripheral depauperation may be as responsible for the Illinois cases, as well as the remarkably small size of the Hollister, Missouri; Onawa and Muscatine, Iowa and Lone Rock, Wisconsin, specimens.

Color Notes.—The color description of the race as a whole, based on all of our typical material, is as follows:

Base color ranging from dirty cream-buff through ivory yellow and honey yellow to olive-yellow on one hand, and through pinkish buff, cinnamon-buff and vinaceous-cinnamon to clay color on the other hand. This base color is often clearer and purer ventrad of the lateral bars on the sides of the body, slightly or distinctly suffused on the dorsum. The paired lateral bars range in tone from sepia, through bister and bone brown to brownish black. Antennae varying in tone from pale zinc orange and dull ochraceous-buff, to ferruginous and cinnamon-brown, always somewhat darkened distad; eyes ranging from hazel and dresden brown to chestnut brown; face rarely infuscate, and then not strongly so, with the adjacent portions of the genæ equally or more de-

cidedly infuscate, leaving a narrow pale postocular line ventrad of the dark line; dorsum of the head rarely with a distinct mediolongitudinal dark line, which, when present, is almost never complete, being divided in two longitudinally, and when continued on the pronotum represented only by a hair line on the median carina.

Tegmina with the base color generally more grayish than the general pale color, more approximating drab, benzo brown and hair brown, the proximal half of the marginal and discoidal fields suffused to a greater or lesser degree with the dark color, this weakly maculate in the female, and in both sexes persistent distad only along the humeral trunk; subcostal stripe indicated in both sexes, ranging from sulphur yellow to aniline yellow and buckthorn brown. Caudal femora of the general color, occasionally washed with the darker color along the dorsal section of the external face; transverse dark bars on the dorsal face of the caudal femora are almost never indicated in typical material of *macclungi*, although suggested in many intermediate individuals: caudal tibiæ ranging from carnelian red and mikado brown to coral red, spines black tipped.

There is a geographic correlation in color tone which is fairly evident in the case of the material from the Platte Valley in Nebraska, these being on an average distinctly paler, and this is as true of the few (4) from Kearney as for the extensive sand-hill series from North Platte. Certain other color correlations might be mentioned, but the series, in each case, is not extensive enough to warrant comment.

The extension of the dark lateral bars on the sides of the dorsum of the pronotum, as found in *Mer. mac. maculipennis*, is present in this race, but is not common, three males alone having it indicated. Material intermediate between this race and true *maculipennis* shows this more generally indicated.

Distribution.—Fron the eastern Yellowstone Valley of Montana (Forsyth and Glendive) south typically to southern Nebraska (Lincoln and Haigler), western Kansas (Syracuse), southern Colorado (Holly and Pueblo) and northern Utah (Salt Lake City and Maple Peak). The eastern limit of the range is apparently reached in south-central Wisconsin (Lone Rock), the central axis of Illinois and southern Missouri (Hollister), while westward it is unknown beyond the Utah localities given above. For data on the area occupied by intermediates between *Mer. mac. maculipennis* and *Mer. mac. macclungi* see under the former.

The vertical distribution of the form extends from as low as 454 feet (Meredosia, Illinois) to as high as 5000 to 6500 feet (Maple Peak). Northward it is known only from relatively low elevations (2515 feet; Forsyth), while in Nebraska it occurs up to about 4500 feet (Glen) and in Colorado to at least 5069 feet (Laporte).

The present form is seen to be a Great Plains and Great Basin type, spreading eastward in suitable environments under satisfactory temperature conditions.

Biological Notes.—Grassy patches and stretches of sparse short grass are frequented by this form, these in a variety of situations, i. e. on bench of the Great Plains (Forsyth and Julesburg), on river plain and adjacent sand-hills (North Platte), on the slopes of hills and foothills (Kearney and Salt Lake City) and on gently rolling plains (Syracuse).

The available data shows the species occurs adult as early as July 8 and as late as September 14, at the same locality (Rocky Ford, Colorado). This locality is very near the southern limit of typical material of the form, and therefore probably represents the region of maximum summer conditions within the form's range. From the more northern region the earliest date we have is July 27 (Forsyth), but the deficiency of data prevents us from giving any late records from the same region.

Remarks.—This typically very distinct race is the northern adaptation of *Mermiria maculipennis*, intergrading, as already shown, into true *maculipennis* in Kansas and Oklahoma, the north Texas material being much nearer typical *maculipennis* than *m.macclungi*. Its relationship to the large south Texan *maculipennis* has never been clearly indicated in the past, and material of the present form has almost invariably been recorded as *bivittata*, to which species *macclungi* is not closely related.

We take great pleasure in dedicating this interesting and striking form to Dr. C. E. McClung, of the University of Pennsylvania, who, from cytological evidence, first called our attention to this race, and also to the distinctness of true *bivittata* from the other forms with which it had been confused and associated.

Specimens examined: 113; 56 ♂, 55 ♀, 2 immature ♀.

Montana: Glendive, Dawson County; 1 ♀; [Hebard Cln. ex Bruner]. Forsyth, Rosebud County; VII, 27, 1909; (H.; in canyon in bench of plains); 15 ♂, 2 ♀, *type*, *allotype* and *paratypes*.

Nebraska: Valentine, Cherry County; (L. Bruner); 2 ♂; [Hebard Cln. ex Bruner and U. S. N. M.]. Chadron, Dawes County; (L. Bruner); 1 ♂, 1 ♀; [Hebard Cln. ex Bruner and

U. S. N. M.]. Fort Robinson, Dawes County; VIII, 1888; 1 ♂; [Hebard Cln. ex Bruner]. Glen, Sioux County; VIII, 6 to 20, 1903; (L. Bruner); 3 ♂, 2 ♀; [Hebard Cln. ex Bruner]. Sidney, Cheyenne County; 1 ♀; [Hebard Cln. ex Bruner]. North Platte, Lincoln County, 2850 feet; VII, 28, 1910; (R. & H.; common in short grass on river plains and adjacent sand-hills); 15 ♂, 15 ♀. Broken Bow, Custer County; VII, 1889; 1 ♀; [Hebard Cln. ex Bruner]. Kearney, Buffalo County, 2146 feet; VII, 27, 1910; (R. & H.; uncommon on hills covered with short grasses); 4 ♀. West Point, Cuming County; VII, 10, 1887 (one), IX (three); 6 ♂, 5 ♀, 1 immature ♀ (no date); [Hebard Cln. ex Bruner]. Fontanelle, Washington County; 1876; 1 ♀; [Hebard Cln. ex Bruner]. Lincoln, Lancaster County; VIII & IX; (L. Bruner); 1 ♂, 4 ♀, 1 immature ♀; [Hebard Cln. ex Bruner]. Burnham, Lancaster County; VIII, 30, 1911; (L. Bruner); 1 ♀; [Hebard Cln. ex Bruner]. Haigler, Dundy County; 1 ♂; [Hebard Cln. ex Bruner]. Stratton, Hitchcock County; VII, 14, 1899; 1 ♂; [U. S. N. M.].

Colorado: Julesburg, Sedgwick County, 3460 to 3550 feet; VII, 29, 1910; (R. & H.; on plains escarpment scantily clothed with grass and sage); 2 ♂, 1 ♀. Poudre Canyon; VIII, 30, 1898; 1 ♂; [U. S. N. M.]. Fort Collins, Larimer County; VIII, 9, 1901; (Dyar and Caudell); 1 ♂, 1 ♀; [U. S. N. M.][70]: VIII, 8 and 19, 1898; 1 ♂, 2 ♀; [Hebard Cln. and A. N. S. P.]. Denver, Denver County; (Beale); 1 ♀; [Hebard Cln.]. Pueblo, Pueblo County; VII, 28, 1878; 1 ♂, 2 ♀; [Corneil Univ. Cln.]: 4700 feet; VII, 30 and 31, 1877; 1 ♂; [M. C. Z.]. Rocky Ford, Otero County; VII, 8, 1899 and IX, 14, 1898; 1 ♂, 1 ♀; [A. N. S. P.].

Kansas: Syracuse, Hamilton County, 3230 feet; IX, 12, 1909; (R. & H.; on plain covered with short grass); 1 ♀.

Wisconsin: Lone Rock, Richland County; VIII, 21, 1906; 1 ♀; [Ill. State Lab. Nat. Hist.].

Iowa: Onawa, Monona County; IX, 2, 1914; (M. P. Somes); 1 ♀; [Somes Cln.]. Muscatine, Muscatine County; VII, 10, 1909; (M. R. Somes); 2 ♀; [Somes Cln.].

Illinois: Havana, Mason County; VIII, 7, 1908; 1 ♀; [Ill. State Lab. Nat. Hist.].

Missouri: Hollister, Taney County; VIII, 1913; (M. P. Somes); 1 ♀; [Somes Cln.].

Utah: Salt Lake City, 4500 feet; IX, 7, 1909; (R. & H.; in grasses near base of foothills); 1 ♂. Salt Lake Valley; VIII, 2, 1896; 1 ♂; [A. N. S. P.]. Maple Peak, Wasatch Mountains, Salt Lake County, 5000 to 6500 feet; IX, 7, 1909; (R. & H.); 2 ♀.

[70] Recorded by Caudell (Proc. U. S. Nat. Mus., xxvi, p. 780, (1903)) as *texana*.

Explanation of Plates V, VI, VII.

Plate V.—Fig. 1.—*Mermiria texana.* ♀. Pine Mountain, Davis Mountains, Texas. Lateral view. (×1½.)

Fig. 2.—*Mermiria texana.* ♂. Sanderson, Texas. Lateral view of head and pronotum. (×3.)

Fig. 3.—*Mermiria texana.* ♂. Sanderson, Texas. Dorsal view of fastigium. (Greatly enlarged.)

Fig. 4.—*Mermiria texana.* ♂. Sanderson, Texas. Dorsal view of fastigium. (Greatly enlarged.)

Fig. 5.—*Mermiria texana.* ♂. Persimmon Gap, Santiago Mountains, Texas. Dorsal view of fastigium. (Greatly enlarged.)

Fig. 6.—*Mermiria texana.* ♂. Persimmon Gap, Santiago Mountains, Texas. Dorsal view of fastigium. (Greatly enlarged.)

Fig. 7.—*Mermiria texana.* ♂. Pine Mountain, Davis Mountains, Texas. Dorsal view of fastigium. (Greatly enlarged.)

Fig. 8.—*Mermiria texana.* ♂. Pine Mountain, Davis Mountains, Texas. Dorsal view of fastigium. (Greatly enlarged.)

Fig. 9.—*Mermiria texana.* ♀. Marathon, Texas. Dorsal view of fastigium. (Greatly enlarged.)

Fig. 10.—*Mermiria texana.* ♀. Marathon, Texas. Dorsal view of fastigium. (Greatly enlarged.)

Fig. 11.—*Mermiria texana.* ♂. Sanderson, Texas. Dorsal view of pronotum. (×3.)

Fig. 12.—*Mermiria texana.* ♀. Marathon, Texas. Dorsal view of pronotum. (×3.)

Fig. 13.—*Mermiria texana.* ♀. Marathon, Texas. Dorsal view of pronotum. (×3.)

Fig. 14.—*Mermiria texana.* ♂. Sanderson, Texas. Lateral view of apex of abdomen. (Greatly enlarged.)

Fig. 15.—*Mermiria neo-mexicana.* ♀. Dallas, Texas. Lateral view. (×1½.)

Fig. 16.—*Mermiria neo-mexieana.* ♂. Syracuse, Kansas. Lateral view of head and pronotum. (×3.)

Fig. 17.—*Mermiria neo-mexicana.* ♂. Sycamore Canyon, Baboquivari Mountains, Arizona. Dorsal view of fastigium. (Greatly enlarged.)

Fig. 18.—*Mermiria neo-mexicana.* ♂. Baboquivari Mountains, Arizona. Dorsal view of fastigium. (Greatly enlarged.)

Fig. 19.—*Mermiria neo-mexieana.* ♂. Syracuse, Kansas. Dorsal view of fastigium. (Greatly enlarged.)

Fig. 20.—*Mermiria neo-mexicana.* ♂. Syracuse, Kansas. Dorsal view of fastigium. (Greatly enlarged.)

Fig. 21.—*Mermiria neo-mexieana.* ♂. Dallas, Texas. Dorsal view of fastigium. (Greatly enlarged.)

Fig. 22.—*Mermiria neo-mexicana.* ♀. Havana, Illinois. Dorsal view of fastigium. (Greatly enlarged.)

Fig. 23.—*Mermiria neo-mexicana.* ♀. Dallas, Texas. Dorsal view of fastigium. (Greatly enlarged.)

Fig. 24.—*Mermiria neo-mexicana.* ♀. Dallas, Texas. Dorsal view of fastigium. (Greatly enlarged.)

Fig. 25.—*Mermiria neo-mexicana.* ♂. Syracuse, Kansas. Dorsal view of pronotum. (×3.)

Fig. 26.—*Mermiria neo-mexieana.* ♀. Dallas, Texas. Dorsal view of pronotum. (×3.)

Fig. 27.—*Mermiria neo-mexicana.* ♂. Baboquivari Mountains, Arizona. Lateral view of apex of abdomen. (Greatly enlarged.)

Fig. 28.—*Mermiria alacris.* ♀. Pensacola, Florida. Lateral view. (×1½.)

Fig. 29.—*Mermiria alacris.* ♂. Pensacola, Florida. Lateral view of head and pronotum. (×3.)

Fig. 30.—*Mermiria alacris.* ♂. Bainbridge, Georgia. Dorsal view of fastigium. (Greatly enlarged.)

Fig. 31.—*Mermiria alacris.* ♂. Bainbridge, Georgia. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 32.—*Mermiria alacris.* ♂. Dallas, Texas. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 33.—*Mermiria alacris.* ♂. Dallas, Texas. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 34.—*Mermiria alacris.* ♂. Pensacola, Florida. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 35.—*Mermiria alacris.* ♂. Waurika, Oklahoma. Dorsal view of fastigium. (Greatly enlarged.)

PLATE VI.—Fig. 1.—*Mermiria alacris.* ♀. Pensacola, Florida. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 2.—*Mermiria alacris.* ♂. Bainbridge, Georgia. Dorsal view of pronotum. (×3.)
Fig. 3.—*Mermiria alacris.* ♀. Pensacola, Florida. Dorsal view of pronotum. (×3.)
Fig. 4.—*Mermiria alacris.* ♂. Bainbridge, Georgia. Lateral view of apex of abdomen. (Greatly enlarged.)
Fig. 5.—*Mermiria intertexta.* ♀. Tybee Island, Georgia. Lateral view. (×1½.)
Fig. 6.—*Mermiria intertexta.* ♂. Tybee Island, Georgia. Lateral view of head and pronotum. (×3.)
Fig. 7.—*Mermiria intertexta.* ♂. Tybee Island, Georgia. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 8.—*Mermiria intertexta.* ♂. Tybee Island, Georgia. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 9.—*Mermiria intertexta.* ♂. Atlantic Beach, Florida. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 10.—*Mermiria intertexta.* ♂. Atlantic Beach, Florida. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 11.—*Mermiria intertexta.* ♀. Tybee Island, Georgia. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 12.—*Mermiria intertexta.* ♂. Tybee Island, Georgia. Dorsal view of pronotum. (×3.)
Fig. 13.—*Mermiria intertexta.* ♀. Tybee Island, Georgia. Dorsal view of pronotum. (×3.)
Fig. 14.—*Mermiria intertexta.* ♂. Tybee Island, Georgia. Lateral view of apex of abdomen. (Greatly enlarged.)
Fig. 15.—*Mermiria bivittata.* ♀. Flatonia, Texas. Lateral view. (×1½.)
Fig. 16.—*Mermiria bivittata.* ♂. Flatonia, Texas. Lateral view of head and pronotum. (×3.)
Fig. 17.—*Mermiria bivittata.* ♂. Flatonia, Texas. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 18.—*Mermiria bivittata.* ♂. Flatonia, Texas. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 19.—*Mermiria bivittata.* ♀. Navasota, Texas. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 20.—*Mermiria bivittata.* ♀. Navasota, Texas. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 21.—*Mermiria bivittata.* ♂. Flatonia, Texas. Dorsal view of pronotum. (×3.)
Fig. 22.—*Mermiria bivittata.* ♀. Flatonia, Texas. Dorsal view of pronotum. (×3.)
Fig. 23.—*Mermiria bivittata.* ♂. Flatonia, Texas. Lateral view of apex of abdomen. (Greatly enlarged.)
Fig. 24.—*Mermiria bivittata.* ♂. Flatonia, Texas. Lateral view of tegmen. (×2.)
Fig. 25.—*Mermiria maculipennis maculipennis.* ♀. Lyford, Texas. Lateral view. (×1½.)
Fig. 26.—*Mermiria maculipennis maculipennis.* ♂. Benevides, Texas. Lateral view of head and pronotum. (×1½.)

PLATE VII.—Fig. 1.—*Mermiria maculipennis maculipennis*. ♂. El Paso, Texas. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 2.—*Mermiria maculipennis maculipennis*. ♂. El Paso, Texas. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 3.—*Mermiria maculipennis maculipennis*. ♂. Benevides, Texas. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 4.—*Mermiria maculipennis maculipennis*. ♂. Benevides, Texas. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 5.—*Mermiria maculipennis maculipennis*. ♂. Dallas, Texas. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 6.—*Mermiria maculipennis maculipennis*. ♂. Dallas, Texas. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 7.—*Mermiria neo-mexicana*. ♀. Sycamore Canyon, Baboquivari Mountains, Arizona. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 8.—*Mermiria maculipennis maculipennis*. ♀ .El Paso, Texas. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 9.—*Mermiria maculipennis maculipennis*. ♀. Sycamore Canyon, Baboquivari Mountains, Arizona. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 10.—*Mermiria maculipennis maculipennis*. ♀. Katherine, Texas. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 11.—*Mermiria maculipennis maculipennis*. ♀. Katherine, Texas. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 12.—*Mermiria maculipennis maculipennis*. ♂. Benevides, Texas. Dorsal view of pronotum. (×3.)
Fig. 13.—*Mermiria maculipennis maculipennis*. ♀. Katherine, Texas. Dorsal view of pronotum. (×3.)
Fig. 14.—*Mermiria maculipennis maculipennis*. ♂. Benevides, Texas. Lateral view of apex of abdomen. (Greatly enlarged.)
Fig. 15.—*Mermiria maculipennis macclungi*. ♂ (*type*.) Forsyth, Montana. Lateral view. (×3.)
Fig. 16.—*Mermiria maculipennis macclungi*. ♂ (*paratype*.) Forsyth, Montana. Lateral view of apex of abdomen. (Greatly enlarged.)
Fig. 17.—*Mermiria maculipennis macclungi*. ♂ (*type*.) Forsyth, Montana. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 18.—*Mermiria maculipennis macclungi*. ♂ (*paratype*.) Forsyth, Montana. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 19.—*Mermiria maculipennis macclungi*. ♂. North Platte, Nebraska. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 20.—*Mermiria maculipennis macclungi*. ♂. North Platte, Nebraska. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 21.—*Mermiria maculipennis macclungi*. ♀ (*allotype*.) Forsyth, Montana. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 22.—*Mermiria maculipennis macclungi*. ♀. Kearney, Nebraska. Dorsal view of fastigium. (Greatly enlarged.)
Fig. 23.—*Mermiria macclungi*. ♀ (*allotype*.) Forsyth, Montana. Dorsal view of pronotum. (×3.)
Fig. 24.—*Mermiria maculipennis macclungi*. ♀. Kearney, Nebraska. Dorsal view of pronotum. (×3.)